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# ELECTRICAL WORLD

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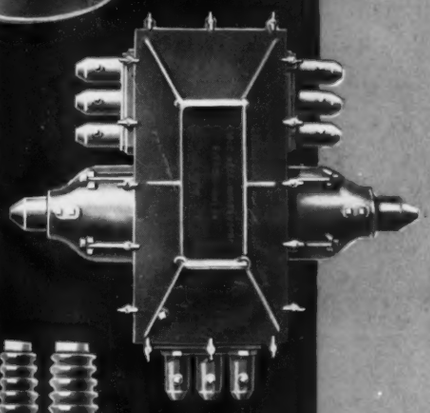

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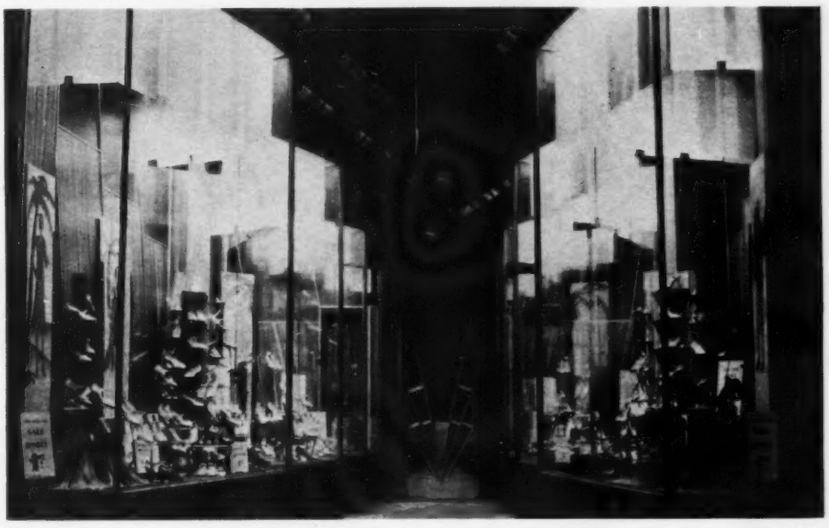

*Modern window lighting* — *Ewing Galloway*


MARCH 7, 1931



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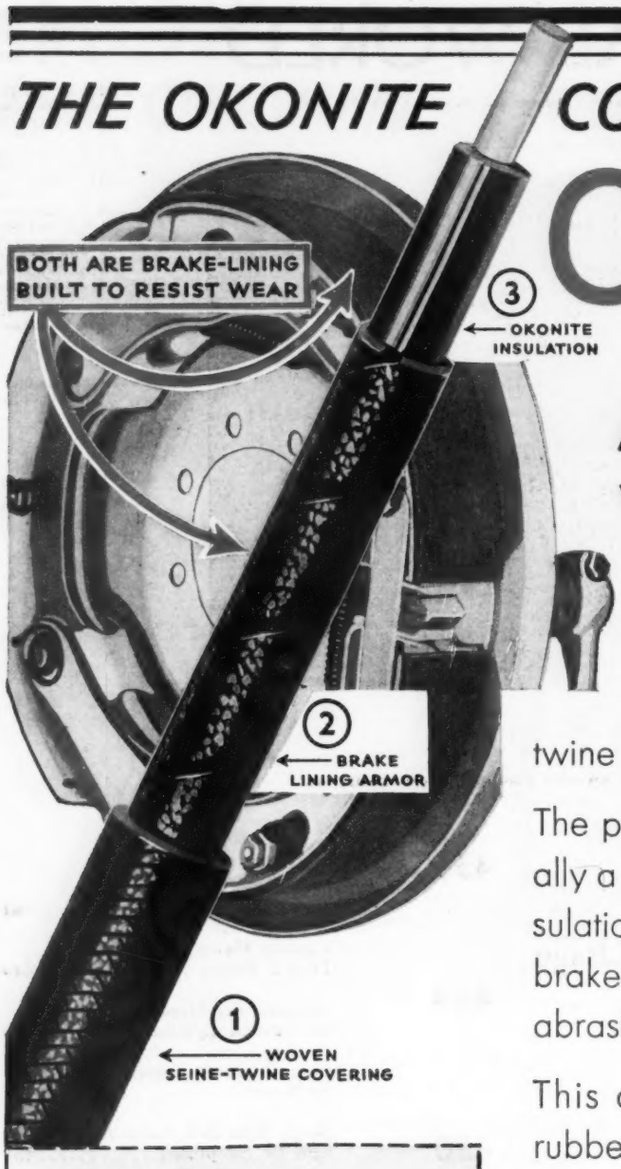


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# ELECTRICAL WORLD

*for the Week Ending*

March 7, 1931

*All solid fuel for the making of heat and power in the future will be burned in the gaseous state. Large-capacity boilers of small physical size will be developed using high speeds and high heat-transfer rates. The practical abolition of the smoke and dust nuisance from solid fuel in thickly settled communities will be accomplished.*

GEORGE A. ORROK,
Combustion Engineer.

## Muscle Shoals bill vetoed, dies

—**Cable joint patent infringed?** Long-used invention, the patent on which is near expiration, achieves renewed importance as assignee plans to collect on violations by utilities—*p. 437.*

—**Another mercury-vapor unit** planned. This will be a 20,000-kw. job similar to that now under way for Schenectady. Public Service Electric & Gas Company will install at Kearny—*p. 438.*

## United Corporation expands in East

—**Drought continues in South,** bringing some power company ponds to lowest level ever recorded for this time of year. Ample steam reserves said to be available generally—*p. 438.*

—**Metal creep is not a menace,** says engineer who contends that high-temperature and pressure-steam plants need not fear this phenomenon. Distortion too slow to be hazardous, he says—*p. 459.*

## Trade inquiry reaches New England

—**Poughkeepsie's full-use plan** another step toward the all-electric home. Although experience is not complete and involves relatively few users, domestic consumption quintupled, while revenue tripled for these customers—*p. 444.*

—**Stage lighting led by baton** at home of Cleveland Symphony Orchestra. Organ-console-type switchboard solves the problem of co-ordinated effects. Vacuum tube controls important here—*p. 457.*

—**New industries have to grow** and plants should be provided with sufficiently flexible distribution systems to allow for expansion and technical changes. Here is a manufacturer who did it—*p. 450.*

—**Our government's failures** in business enumerated for utility engineers. A long and imposing review, it offers the best argument possible against governmental nationalization of the power business—*p. 454.*

# President Riddles Provisions of Shoals Bill in Veto Which Stands

APPEALS from Southern delegations, office holders and citizens and from advocates of public ownership in other regions failed to prevent President Hoover from returning the Norris Muscle Shoals resolution to Congress last Tuesday with a vigorous veto message, this action following presidential study both of the measure and of disapproving reports from members of the Cabinet to whom the Chief Executive had referred it.

Mr. Hoover had previously given out a statement in which he said that, although Muscle Shoals had been "transformed into a political symbol" and was now "expected to be a political issue," he regarded the situation as one involving "business merits and demerits subject to the cold examination of engineering facts."

"One side issue of this political phase," Mr. Hoover said in this preliminary utterance, "is the use which has been made of Muscle Shoals to sidetrack effective action on the federal regulation of interstate power in co-operation with the states. Before and since taking office I have proposed this as a measure of essential protection to the 75,000,000 consumers and several million investors in power securities in all walks of life, who use and own the 35,000,000 hp. of the country. This public necessity has been laid aside for eighteen months and the time of Congress given to 1 per cent of the power and the interests of 1 per cent of the people of the United States, which is the proportion of the Muscle Shoals problem to the whole."

When the veto message reached the Senate a vote to override it failed by 49 to 34, or seven less than the required two-thirds majority. Senator Norris and other members attacked the President as siding with the "power trust."

Chief points made in the veto were the uneconomic nature of the proposal, which would bring federal expenditure of probably $100,000,000, cost more than $9,000,000 annually for operation of the plants and involve a loss, according to Mr. Hoover's figures, of nearly $2,000,000 a year; the futility of the proposal to lease the fertilizer plants and the unprofitable character that government operation of them would assume; the unlikelihood of obtaining a competent board of directors for the small salaries offered ($7,500 the first year and then $5,000) and under the stipulations imposed; the undesirability of the government entering any business to compete with private citizens; the enchoachment on state rights involved; the feasibility of Alabama and Tennessee arranging jointly to lease and operate the plants for the benefit of those states and of agriculture generally, and the admitted obligation of the government to build the Cove Creek Dam, which, however, the message said, should be undertaken on the same conditions as those imposed at Boulder Canyon.

## From President's Veto of Muscle Shoals Bill

Assuming that the whole 1,000,000,000 kw.-hr. should be sold to municipalities or other power distributors, it would, on the basis of the realization by the private companies of 7.2 mills, yield a gross annual income to this project of about $7,200,000, or a loss upon this basis of nearly $2,000,000 annually. This territory is now supplied with power, and to obtain such an income it would be necessary to take the customers of the present power companies. To secure these customers it would be necessary to undercut the rates now made by them. . . .

The leasing provision [for the nitrate plants] is of no utility. It may at once be dismissed. In consequence, the project we have to consider under this bill is the manufacture of fertilizers by the federal government. The Department of Agriculture reports that these plants are now more or less obsolete and with power at even 2 mills per kilowatt-hour, with proper charges included, could not produce the products for which they are constructed as cheaply as these products are now being sold in the wholesale markets. . . .

This bill raises one of the important issues confronting our people. That is squarely the issue of federal government ownership and operation of power and manufacturing business, not as a minor byproduct, but as a major purpose. Involved in this question is the agitation against the conduct of the power industry. The power problem is not to be solved by the federal government going into the power business, nor is it to be solved by the project in this bill. The remedy for abuses in the conduct of that industry lies in regulation and not in the federal government entering upon the business itself. . . .

I would suggest that the States of Alabama and Tennessee, which are the only ones primarily concerned, should set up a commission of their own representatives together with a representative from the national farm organizations and the Corps of Army Engineers; that there be vested in that commission full authority to lease the plants at Muscle Shoals in the interest of the local community and agriculture generally. . . .

The federal government should, as in the case of Boulder Canyon, construct Cove Creek Dam as a regulatory measure for the flood protection of the Tennessee Valley and the development of its water resources.

▼

## St. Lawrence Commission Members Prepare Bill

A PROPOSED STATUTE creating "the Power Authority of the State of New York" to develop hydro-electric power in the International Rapids section of the St. Lawrence River was submitted on Monday by the four majority members of the St. Lawrence Power Development Commission to Governor Franklin D. Roosevelt and the majority leaders of the Senate and Assembly. The statute, drafted to carry out the recommendations submitted by the majority in its report of January 15 and summarized in the ELECTRICAL WORLD for January 17, provides for a body consisting of five trustees, modeled generally after the Port of New York Authority.

In submitting the proposed bill the majority members emphasize nine points of view held by them. Condensed and paraphrased, these are:

1. To bring about the greatest practicable rate reductions to domestic and rural customers the most promising method is to merge St. Lawrence power with other power and establish rates by contracts based on controlled accounts.
2. State-owned transmission systems without definite assurance of adequate distribution would not achieve the foregoing result. Competition with existing systems would not be economically sound.
3. A comprehensive state-owned transmission and distribution system would have to rely on state credit; the Power Authority on its own credit could not borrow large enough sums.
4. The sums necessary are too great to be made available by appropriation; state bond issues would be necessary, approved by referendum.
5. Any such procedure should wait upon a report from the Power Authority saying that negotiations for contract with private power systems have failed.
6. Such postponement would leave unimpaired every element of the state's bargaining power.
7. Pledges of co-operation from the existing systems should be accepted without suspicion or fear, public hearings and the Governor's reserved veto power safeguarding the public interest.
8. The Power Authority in its negotiations would not be at the mercy of any

## PHILADELPHIA ART MUSEUM RESPONDS TO FLOODLIGHTING

—*Underwood & Underwood*

existing corporation, but free to contract with any new company that may come into being.

9. The Power Authority must in its discretion be authorized to apply for a federal license, while taking every precaution to preserve the state's rights to the power and the riverbed. To proceed upon the theory of the minority report that the federal water-power act is not applicable would inevitably involve litigation and indefinite delay, and no funds could be raised until and unless the United States Supreme Court sustained this interpretation.

On March 4 Governor Roosevelt announced his approval of the majority measure "in principle," saying that he would call the legislative leaders in conference in the near future and would then recommend a number of changes, not, however, of a fundamental character. He expressed himself as particularly pleased with the fact that the bill left a door open for the state to enter the field of power transmission should the Power Authority find itself unable to negotiate contracts with the Niagara-Hudson interests.

The Republican legislative leaders are also quoted as favoring the bill, which, they are said to claim, vindicates their own views on St. Lawrence development.

▼

## Federal Trade Inquiry Reaches New England

TESTIMONY BEFORE the Federal Trade Commission at the resumption of its utilities inquiry on March 2 and 3 concerned the New England Power Association and led to a detailed account of its history and present connections and set-up by Judson C. Dickerman and W. B. Horne, respectively examiner and accountant for the commission. S. W. Brookhart, Jr., commission economist, testified about the association's interstate power movements. A digest of the testimony will appear in a subsequent issue of the ELECTRICAL WORLD.

## Friends Honor Insull on Notable Anniversary

SEVEN HUNDRED EXECUTIVES of the Insull group of public utilities assembled at the Palmer House, Chicago, on Saturday evening, February 28, to celebrate by a "family dinner" the fiftieth anniversary of Samuel Insull's arrival in America as a youth of 21 to become secretary to Thomas A. Edison. John F. Gilchrist, vice-president Commonwealth Edison Company and the oldest "Edison" man in Chicago in point of service, was master of ceremonies. All of those present, many of whom made long journeys to attend, were either officers, directors or executives of Insull properties. They represented 40 or more states, Canada and Great Britain and were grouped according to geography.

By amplified long-distance telephone the diners heard Mr. Edison, speaking from his Florida home, congratulate and praise his one-time employee. The other speakers were Samuel Insull, Jr., who briefly presented his father, and the chief guest of the occasion, who confined himself to personal experiences during his half century of activity in this country. For a brief time the dinner proceeded with no illumination save that from replicas of the original Edison incandescent lamp of 1879.

▼

## Low Bid for Hoover Dam by Western Combination

SIX COMBINED Western construction firms, known as the Six Companies, Inc., of San Francisco, submitted the low bid at Denver on Wednesday for the general contract on the Hoover Dam and power plant, and won a recommendation from Commissioner of Reclamation Mead that the figure of $48,890,995.50 be accepted by Secretary Wilbur. The general contract specifies that work must be started within thirty days from notification of acceptance of the bid.

The bid of the Six Companies was $5,002,883.20 lower than that of its closest competitor, the Arundel Corporation of Baltimore. The other competitor, Woods Brothers Corporation of Lincoln, Neb., bid $58,653,107.50.

▼

## Southwestern Engineers Report Facts and Ideas

SEVENTY-FIVE ENGINEERS of Texas, Louisiana, Mississippi, Arkansas and Oklahoma utility companies attended meetings of the Engineering Section, Southwest Division, N.E.L.A., in Oklahoma City recently. Among subjects that came up for discussion was the coating of condenser tubes caused by the pollution of feed water by crude oil. It was testified that where sand is present in the water enough is carried in solution through the tubes to keep them in good condition. Where sand is not present frequent cleaning of the tubes is necessary. Another point that caused comment was the trial of welded boiler drums to prevent caustic embrittlement, the absence of seams obviating high concentration. The introduction of sulphates into the feed water in the ratio to carbonates of two to one for 175-lb. pressure and three to one for high pressure was a recommendation.

Information was given concerning the first 1,400-lb. steam-pressure unit in the Southwest. This is an 8,000-kw. turbo-generator just added to an old plant of the San Antonio Public Service Company in that city which since the completion of the Comal generating station at New Braunfels has been used as a standby. Exhaust from the new high-pressure unit operates an older 12,000-kw. generator at 175 lb. pressure, thus providing 20,000 kw. of adequate standby capacity.

## Power and Regulation in State Legislatures

ALABAMA.—Three bills aimed at the Alabama Power Company have been introduced in the House by Representative Glover. The first, patterned after the Maine law, would forbid exportation of power except as carried on under present contracts. The second would require light and power companies to pay taxes on the same valuation used for a rate base. The third would extend the tax of 0.4 mill a kilowatt-hour now imposed on hydro-electric power manufactured in the state to cover steam-electric output as well.

IDAHO.—The Senate has adopted a joint resolution providing for a referendum on a constitutional amendment to permit taxation of municipally owned utilities. A bill proposing the abolition of the Public Utilities Commission has been defeated by the Senate. A bill providing for the construction and operation of utilities by municipalities without resorting to bond issues, the costs to be paid from revenues, has been passed by the House, which later voted to reconsider the measure.

INDIANA.—The Senate has overridden the majority committee recommendation reported last week for indefinite postponement of the bill to assess a pole and wire fee against public utilities for use of the public highways, and the bill was advanced to second reading.

KANSAS.—The House has passed without debate the bill to prohibit public utilities from engaging in the merchandising business. The public utilities committee of the Senate has approved the bill to place holding companies under the jurisdiction of the commission. A companion bill is pending in the House.

MINNESOTA.—A bill authorizing municipalities to engage in the power business on a commercial scale and to serve surrounding communities as well as their own is before the Senate. It would require a popular vote to authorize construction of municipal power plants and for extensions of power lines. The bill for the issue of $50,000,000 in hydro-electric bonds was defeated when the House committee on public domain voted for indefinite postponement. The bill was also defeated two years ago.

NEW YORK.—A bill introduced in both houses by the Republican leaders sets up a temporary state commission of six members, two to be appointed by the Governor, two to be Senators and two Assemblymen, to act jointly with similar commissions of adjoining states in making a survey of interstate transmission of power and formulating a treaty embracing such states and the federal government and to recommend legislation to regulate and control utility companies engaged in such interstate transmission. At a hearing on the Thayer bill to put electric submetering companies under regulation of the Public Service Commission W. L. Ransom, for the New York Edison Company, said that the company opposed the bill because "it would fasten on the city of New York the present rates for electrical energy and would prevent future rate reductions."

NORTH CAROLINA.—Morris L. Cooke of Philadelphia, who drew the Pinchot "giant power" plan in 1923, told the joint finance committee of the Legislature that a proposed tax of 2 mills a kilowatt-hour on hydro-electricity generated would not have to be passed on to household consumers, but refused to say whether or not it would result in increased rates to industrial consumers. A subcommittee is seeking to devise ways and means to raise approximately $2,000,000 from power companies, besides the estimated revenues from them proposed in the budget revenue bill. The committee is divided as to whether the additional tax shall be on a kilowatt-hour basis or in the nature of a consumers' tax.

OKLAHOMA.—The Senate committee on public service corporations has followed the example of the House committee in reporting favorably the bill to prohibit utilities from selling merchandise and has passed it. The House has passed the measure referred to last week taxing the capital stock of corporations, including utilities.

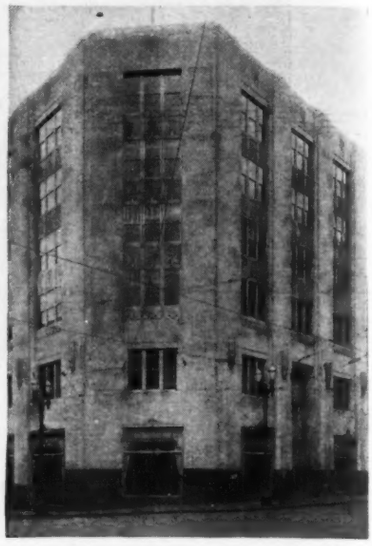
OREGON. — Governor Meier has signed the bill which provides for the repeal of the public convenience and necessity law. The Legislature amended the bill to provide that the certificate clause shall still be applicable to municipalities having 2,000 population or less. The utilities committee refused approval to the bill for the taxation of municipally owned utility properties in the same manner that privately owned utilities are taxed. The three important bills noted last week—to change the Public Service Commission to a one-man body, to create a hydro-electric commission and to provide for the formation of public utility districts—have all been passed.

PENNSYLVANIA. — Governor Pinchot appeared this week before the Senate committee investigating the Public Service Commission and reiterated charges that the commission was "worse than useless" as a defender of the people. "I believe," he said, "that there is no other body under the government of Pennsylvania that has been so completely, so continually and so notoriously controlled by the corporations as the Public Service Commission." He asserted that, "after depreciation reserves have been deducted, six public utilities in Pennsylvania directly under the supervision of the Public Service Commission earned in the year 1929, respectively, 28.5, 34.18, 38.75, 45.4, 51.8 and 69.65 per cent on their own valuations." He did not name the companies. Other legislative items are the introduction of House bills to prevent public utilities from engaging in the merchandising business and from billing consumers on a monthly basis for such purchases and to prevent new tariff schedules of utilities from becoming effective unless approved by the commission. Under the present law such schedules become effective 30 days after filing.

TEXAS.—A conference on the movement to establish a public service commission to control utilities was to be held on March 3. The Petsch bill gives cities control of their public utilities with power to fix rates and provides that where the utility company is dissatisfied it can appeal to a commission to be created by the bill. The larger utilities are generally opposed to this bill. They favor the principle in the Holbrook bill, which creates a utilities commission with power to fix rate base over the entire state without the consent of the cities. Mayors and managers of 26 municipalities met at Austin to protest against the latter plan.

WEST VIRGINIA.—After a prolonged hearing during which opposition was vigorously expressed by prominent utility men interested in West Virginia water-power development, the House of

## ST. PAUL HAS LATEST OFFICE BUILDING



*The Northern States Power Company's office building at St. Paul, opened last week, of which the front is here shown, has many up-to-date electrical and architectural features.*

Delegates on February 27 passed the Hodges-Watkins bill, amending the 1929 water-power act in three major respects, by a vote of 75 to 11. The bill increases the royalty rate from 10 cents to $2 per horsepower, defines the word "project" to mean a single unit of development and inserts a new recapture clause (ELECTRICAL WORLD, February 27, page 262.) If the bill becomes law, it is freely predicted that would-be developers will lose their interest in the state's hydro resources. Under the terms of another House bill originating in the committee on taxation and finance a depletion or gross sales tax of 4 per cent would be levied upon the gross proceeds of water-power companies operating in West Virginia, over and above all other royalty taxes, and the same rate is fixed as to companies furnishing electric light and power. Electric light and power companies pay three-fifths of 1 per cent under existing law. The House has passed a bill requiring the Public Service Commission to use in rate cases the valuation of a public utility submitted to the state tax commissioner and an amendment to another bill relating to the commission that would provide for the election of the members of the commission and of a people's counselor.

WISCONSIN.—A bitterly contested joint resolution calling for a constitutional amendment to permit Wisconsin to engage in the public utility business was adopted by the Senate February 24 and sent to the Assembly. The vote was 18 to 14. Under the terms of the resolution the question of state-owned and state-operated utilities will be put to a referendum vote. The present Assembly and the next Legislature must adopt the resolution before it goes to a referendum. The Legislature, following the referendum, must then adopt the measure before it becomes law. The state could under this measure, recapture its water power and engage generally in the light, heat and power business. State corporations could be formed which would issue unlimited obligations.

▼

## Supreme Court Dismisses Alabama Power-Tax Suit

ALABAMA'S SUIT to recover from the United States taxes alleged to be due under a state law upon hydro-electric power sold by the federal government at Muscle Shoals, plus penalties and interest because of non-payment, came to an end last week when the United States Supreme Court denied jurisdiction, thus sustaining the Court of Claims' dismissal of the suit. In its opinion the Supreme Court said:

We do not see how the claim of the state can be said to be founded upon the Constitution. If the claim is valid, which we are far from implying, it is under the state's original powers as such, and the only bearing of the Constitution is that it did not take the power away. Neither do we regard the claim as one for damages in a case not sounding in tort within the meaning of the act. There are few cases of this sort that cannot be brought under the head of a contract implied in law, and it being established that such contracts are not within the jurisdiction of the Court of Claims, we think that this phrase cannot be extended to a controversy concerning the boundary between the two sovereign powers. The claim is not technically one for damages as was the claim in assumpsit. It is a claim for a tax that the United States never has promised to pay and for a penalty. It does not fall within the act as it has been construed for many years.

▼

## Are Utilities Infringing Cable-Joint Patent?

THREE RECENT EVENTS have revived widespread interest in the United States Court of Appeals' (Sixth Circuit) decision of December 6, 1929, against the Cleveland Electric Illuminating Company for infringing the Torchio patent on cable joints (No. 1,172,322), as a result of which, it has been alleged, the company had to pay $18,000 royalty for 900 joints, or $20 a joint.

One of these events was the finding of a paper presented March 9, 1911, by C. Vernier before the (British) Institution of Electrical Engineers. This paper, published in the *Journal* of the Institution (Vol. 47, 1911), is alleged by some engineers to cover the features patented by Torchio and to antedate his application, filed March 13, 1915.

Another event was the revelation that two engineers jointly witnessed on November 10, 1930, the digging up and testing of a cable joint alleged to embody features covered in the Torchio patent and to have been installed in 1914—before the patent application.

The third event was the offer on February 18, 1931, by a representative of the patent assignee to consider settlement on the basis of joints to be installed in the future and to waive past infringements if the proposed plan is accepted. The settlement would be based on operating voltage of joints and their number, and it could be extended over a period of years, possibly two years beyond expiration of the patent, which will occur on February 22, 1933. The offer points out that the patentee would disregard the royalty rate established in the alleged settlement with the Cleveland company by a prior assignee. If utilities were licensed to apply the patent, they would not have to pay an additional royalty if they purchased joints from cable manufacturers.

The assignee making this offer through E. R. Alexander of the Cleveland Trust Company said that there was no intent to levy an unreasonable tax on the industry and that, in his view, the situation should be so handled as to avoid the expense of further litigation and to allow utilities and manufacturers to develop further possibilities of the oil-filled joint. However, if necessary, the assignee's representative asserts, the owners are prepared further to contest Torchio

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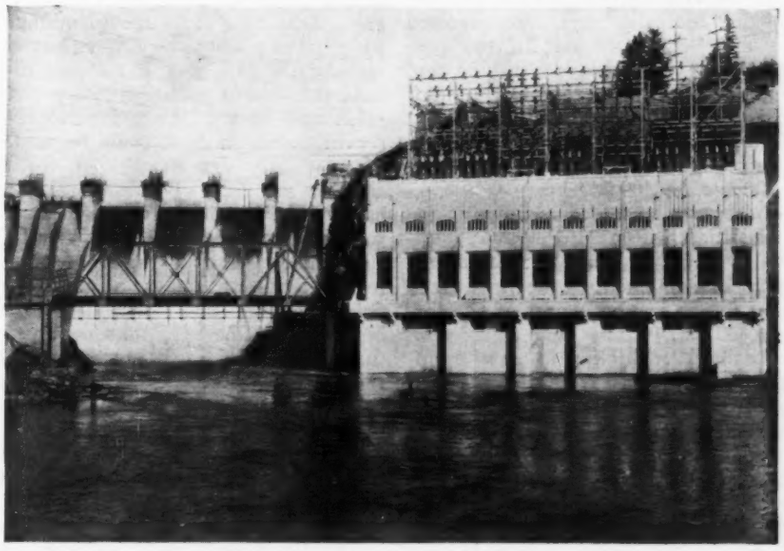
## BRITISH COLUMBIA'S LATEST HYDRO PLANT



*Operation of this first 47,000-hp. unit in coming 188,000-hp. development at Ruskin is another step in putting the Canadian Pacific province in the ranks of great water-power producers, along with Quebec, Ontario and Manitoba.*

patents in other jurisdictions. If compelled to do so, settlement would not be made on the same basis as is now offered. Time is the essence of the offer.

The patent in question was issued to Philip Torchio, vice-president and chief electrical engineer of the New York Edison Company, on February 22, 1916, and was assigned by him to the late Thomas E. Murray, whose successors reassigned it, the last-recorded assignment being in November, 1930—a year subsequent to the Court of Appeals' decision. It is alleged that Mr. Torchio did not benefit from the patent and does not stand either to gain or to lose from any litigation over it.

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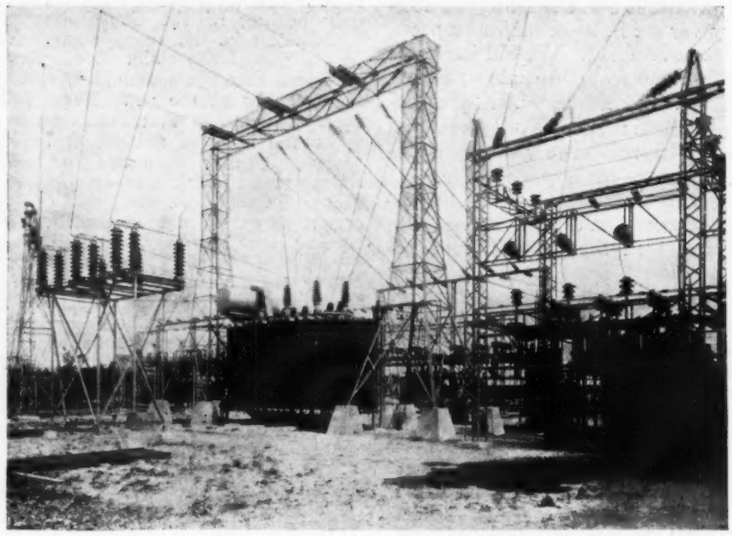
## Kearny to Add a Steam and a Mercury-Vapor Unit

ANNOUNCEMENT IS MADE by the Public Service Corporation of New Jersey that a 75,000-kw. steam turbo-generator will be added to its Kearny plant in time for service in 1932. The existing boilers will be improved so that they can produce the required steam. In addition, the decision has been made to install at Kearny, also for use next year, a 20,000-kw. mercury-vapor boiler and turbine. This rating is the same as that of the one that the General Electric Company will build at Schenectady for its own use jointly with use under lease by the New York Power & Light Corporation (ELECTRICAL WORLD, January 17, page 129) and twice the size of the Hartford Electric Light Company's unit in its South Meadow plant. The General Electric Company will install the mercury-vapor unit for the Public Service company. The innovation, the company says, was decided upon after close analysis of the performance of the Hartford turbine and in the belief that it promises greater efficiency in the generation of power at Kearny. The two new units will increase the rating of that station from 214,500 kw. to 309,500 kw.

Other plans of the company include the addition of a 15,000-kw. high-pressure exhaust turbine and the necessary boiler equipment to the Burlington station in the southern part of the territory. This will be done next year. Eventually 225,000 kw. in new equipment may be installed on land acquired next to the Burlington plant, as previously foreshadowed in these columns (May 31, 1930, page 1064). Negotiations are under way to acquire a right-of-way for a 132-kv. transmission line from Trenton to Camden. Right-of-way for a transmission line leading from the site of the proposed great generating station at Sewaren, near Perth Amboy, to a right-of-way already owned was bought last year.

## 45,000-KVA. SELF-COOLED TRANSFORMER



*This transformer, recently completed by the Swedish General Electric Company for an outdoor station at Morarp, is rated at 45,000 kva. and 126,000 volts. The three windings are concentrically arranged with the high-tension one in the center. The second and third windings are rated respectively at 57,500 volts and 52,500 volts plus or minus 5 per cent, with outputs of 35,000 kva. and 30,000 kva.*

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## Drought Conditions in South Are Unrelieved

RECORD LOW-WATER conditions in most of the Southeastern states persist, Virginia, the Carolinas and Georgia being especially hard hit. Reservoirs of several of the larger power companies are at the lowest stages ever known at this season of the year. Some of these ponds are approaching their record minimums for all time. These conditions obtain in spite of the fact that in the past it has been possible to count on heavy winter rains and snows to provide water reserves on which draft could be made in the normally dry months of the late summer and fall. The low stages also have come about during a period of reduced power demand.

Precipitation over much of the affected territory shows a greater deficiency from the normal since the beginning of the year than occurred in the same period in 1930. In fact, the rains and snows that have come have little more than taken care of evaporation from the surface of the watersheds and ponds. Percolation has been too limited to restore seriously depleted ground-water reserves.

All of the electrical power systems involved are understood to have ample steam reserves to take care of such emergencies as may arise. Interconnection should also relieve any serious problems in meeting demands for service. The policy of some of the systems, it is reported, has thus far been to rely on such hydro generation as has been possible, with little use of steam reserves. At least one of the larger systems is using no steam capacity thus far.

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## Contract Let for Another Big Unit in Long Beach

CONTRACT HAS BEEN AWARDED to the Stone & Webster Engineering Corporation by the Southern California Edison Company for the design and construction of the 100,000-kw. unit foreshadowed in its budget. This unit, to be erected in the Long Beach steam station, will, according to George C. Ward, executive vice-president of the Edison company, cost approximately $7,500,000. It is expected that construction will be completed in 1932. Work on the condensing-water intake and tunnels already is under way.

With the addition of this unit, the third with its rating to be installed in Long Beach, the total station capacity will be increased to 515,000 kw. The new unit will be the twelfth installed since the station was begun in 1911. Two 100,000-kw. units were installed in the third section of the station in June, 1928, and February, 1930, respectively. The new unit will be like them in all major respects.

## Scattered Happenings in the Electrical Sphere

### United States

BRIEFS IN THE NEW RIVER power case, asserting the complete jurisdiction of the Federal Power Commission and opposing the issuance of a minor-part license, have been filed with the commission by the National Popular Government League and by Governor Pinchot of Pennsylvania, who contends that to issue the modified license sought by the company would contravene the purposes of the original advocates of the water-power act, of whom he was one. Supplemental briefs have been filed by the Appalachian Electric Power Company and the State of Virginia.

APPEAL TO THE CALIFORNIA SUPREME COURT by the Pacific Gas & Electric Company to set aside the order of the Shasta County Superior Court which restrained the power company from diverting waters from Hat Creek has caused the citation of Louis P. Joerger, Hat Creek farmer who claimed that the waters were riparian to his land, to appear on April 7 to show cause why the injunction should not be dissolved. In the meantime the power plant will continue inactive.

A COMPROMISE PRICE of $160,000, subject to judicial approval, for the small Foshay plant near Polson, Mont., on the Flathead Indian reservation, has been agreed upon, the federal government being the purchaser. The government's first offer was rejected by the court, as previously noted.

COMPLETION OF A 132-KV. transmission line from Cincinnati to Louisville, connecting the main steam station of the Cincinnati Gas & Electric Company and the hydro station of the Louisville Gas & Electric Company is announced. The contract provides an interchange of off-peak and surplus power.

FOLLOWING THE DISSOLUTION of the injunction obtained against it by the Georgia Power Company, the Georgia Public Service Commission has fixed March 24 as the date for a hearing on the company's Crisp County rates.

CHIEF JUSTICE HUGHES has announced that the Supreme Court of the United States has consented to review the controversy between the De Forest Radio Company and the General Electric Company over the validity of the latter's patent covering vacuum radio tubes.

BAY CITY (MICH.) advocates of municipal ownership are pushing the idea of a city-owned generating plant, and proposals for construction of a 5,000-kw. power house capable of increase to double that amount have been solicited by the authorities. The Consumers Power Company, under a charter expiring in 1932, now sells energy to the city at a low rate for resale at the same rates charged by the utility to its own direct customers.

A POWER PLANT, to cost $540,000, will be built by the Northwestern Public Service Company of Huron, S. D., at North Platte, Neb., to supersede its present structure.

FOR THE SECOND consecutive year the Northern States Power Company has won the Harvard advertising award and prize of $1,000 for the best local advertising campaign conspicuous for excellent planning and execution.

ACTION HAS BEEN TAKEN by residents of the Vermilion Valley in northern Minnesota to bring about consideration of a 25-year development program in the Vermilion River basin, including construction of dams for power purposes. A plant and four dams on the Vermilion are proposed. The district extends to the Canadian border.

RATE REDUCTIONS totaling $150,000 a year by the San Diego Consolidated Gas & Electric Company, in accordance with its policy of keeping its earnings on the basis of a 7½ per cent return on the historical cost of its properties, will become effective April 1, if the California Railroad Commission approves. It will be the fourth reduction in three years.

THE FEDERAL POWER COMMISSION has just reversed an order of the old commission for a hearing of the Yosemite Power Company on its application for a license and has announced orally that it will grant a preliminary permit to the Turlock and Modesto irrigation districts of California for a power development on the Tuolumne River.

### Canada

EIGHT HUNDRED MEN are now employed on the Beauharnois power development, on the St. Lawrence. The corporation has disposed in advance of 462,000 hp. out of the total of 500,000 hp. which its diversion rights permit.

THE ANNUAL REPORT of the Saskatchewan Power Commission shows that government-owned lines now total 1,151 miles, all but 55 miles of which were built in 1930. The commission last year purchased small plants and equipment in 35 different towns and entered into agreements with 87 towns and villages for the supply of electricity. Total generating capacity of the commission's plants is 26,325 kw., while the capacity of all municipally owned plants in the province is 37,024 kw. and that of privately owned plants 29,227 kw.

### Abroad

SWEDEN CONTEMPLATES electrifying 532 more miles of railroad, the largest stretch being 340 miles from Jaerna to Norrkoepping and Malmoe.

GENERATING PLANTS in Algiers and contiguous territory now represent a total of 220,000 kw., of which 190,000 kw. is operated by steam and internal-combustion engines and 30,000 kw. by water power. Plants totaling 100,000 kw. are in course of erection.

SOVIET RUSSIA is now building a broadcasting station at Noghinsk, a suburb of Moscow, which will have a power of 500 kw. and thus be the largest in the world. The Soviet also hopes to have eleven new 100-kw. stations and 28 10-kw. broadcasters in operation before the end of 1933. It further reports that 47 stations are already operating, that about 2,746,000 receiving sets are in use and that 14,000,000 will have been distributed by 1933.

## Coming Meetings

**American Institute of Electrical Engineers** — District meetings, Pittsburgh, March 9-13; Rochester, April 29-May 2. F. L. Hutchinson, 33 W. 39th St., New York.

**Oklahoma Utilities Association**—Oklahoma City, March 10-12. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

**Pacific Coast Electrical Association**—Engineering Section, Fresno, Calif., March 11-13. K. I. Dazey, 447 Sutter St., San Francisco.

**Illinois State Electric Association** — Springfield, Ill., March 12 and 13. G. W. Schwaner, 205 Illinois Mine Workers Bldg., Springfield, Ill.

**Artistic Lighting Equipment Association**—New York, March 16. C. L. Benjamin, 420 Lexington Ave., New York.

**Northwest Electric Light and Power Association** — Commercial Section, Spokane, Wash., March 16-18; Engineering Section, Wenatchee, Wash., March 18-20; Accounting Section, Salt Lake City, April 13 and 14. B. Snow, 1208 Spalding Bldg., Portland, Ore.

**Southeastern Division, N.E.L.A.**—Vinoy Park Hotel, St. Petersburg, Fla., April 1-3. C. M. Kilian, 508 Haas-Howell Bldg., Atlanta, Ga.

**Arizona Utilities Association**—Biltmore Hotel, Phoenix, April 8-11. J. S. Arnold, 300 West Washington St., Phoenix.

**Great Lakes Division, N.E.L.A.**—Engineering Section, Chicago, April 9-11. L. F. Hickernell, Consumers Power Bldg., Jackson, Mich.

**Maryland Utilities Association** — Lord Baltimore Hotel, Baltimore, April 10. D. E. Kinnear, 803 Court Square Bldg., Baltimore.

**Missouri Association of Public Utilities**—Excelsior Springs, Mo., April 16-18. F. D. Beardslee, 315 N. 12th St., St. Louis.

**Southwestern Division, N.E.L.A.**—Mineral Wells, Tex., April 21-24. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

**Electrochemical Society** — Hotel Tutwiler, Birmingham, Ala., April 23-25. C. G. Fink, Columbia University, New York.

**National Electrical Manufacturers' Association**—Hot Springs, Va., May 18-23. A. W. Berresford, 420 Lexington Ave., New York.

**National Electric Light Association**—Atlantic City, June 8-12. A. J. Marshall, 420 Lexington Ave., New York.

©Samuel Insull

# Samuel Insull

Secretary to Edison in 1881
Pioneer electrical manufacturer
Started Chicago power district with vision of future
Integrated scattered plants into service units
Foresaw service and financial benefits of consolidations and holding companies
Developed service reliability to high degree
Stabilized investment values for small and large shareholders of his companies
Early advocate of state regulation
Acquired coal mines to safeguard service
Early secured public and employee participation in financing
Early established service annuities and savings funds for benefit of employees

# EDITORIALS

L.W.W.MORROW
*Editor*

## Turn more light upon distribution costs

SEGREGATION of distribution costs is needed more than ever before because the public does not comprehend why these costs are relatively high compared with others. Although many companies have used itemized costs of this character to determine the expense of serving different classes of business and to guide moves for economy, these costs have not had the publicity that has been given to production costs, and since the public hears of nothing but the low values of the latter it is no surprise that it reaches the conclusion it does.

When the public hears more frequently about systematic analyses of distribution costs and knows that they are being used to establish the most equitable tariffs, political agitation will have less weight. Political attacks are not due to the divulging of generating costs but to failure to give equal emphasis to distribution costs—domestic, commercial and industrial. Of course, the intermingling of services prevents absolutely accurate allocation of costs, but it does not eliminate the relative value of data apportioned according to the best knowledge obtainable.

Sufficient study already has been made of cost allocation to show that this is a difficult problem to solve by a single method or plan. But the general basic principles should be determined and the influence of local modifying elements, such as quality of service and territorial conditions, ascertained. If these topics were discussed as thoroughly in committees and conventions as other economic engineering topics have been, a consensus of opinion might be developed on how to make analyses more accurate and more generally applicable. If this task is not initiated and carried to fruition by the industry, sooner or later commissions will prescribe the details of cost allocation and methods for ascertaining values.

Insistently the public asks: "Why the spread between generating and customer cost?" Publicity on analyses of distribution costs is the only answer. Incidentally these analyses may show where economies can be effected. If economies are found possible, the industry may be trusted to do as popular a job as it has with production costs.

## Power-pool economies stressed

IT IS becoming more evident that interconnection between properties for two-way energy flow is most economical only when the entire interconnection is operated as a power pool. Even the jointly owned highly efficient base-load power station becomes obsolete in a few years, and early contracts must be modified to meet new conditions. The economical study of an interconnection requires an hour-to-hour schedule of the interconnected system capacity so that the pool as a whole may generate and distribute power in the most economical way. This schedule must be changed frequently as loads change and as new plants are built. Base-load plants are soon relegated to peak-load service, and the ever-shifting economic panorama must be met by a flexible operating schedule.

Many properties, still failing to understand the economic value of an absolute pooled control that is flexible, attempt to fix short-lived and impracticable contract stipulations. Others fail to subordinate their individual economic advantage under one load condition to the interest of the entire pool and neglect the truth that as one gives so shall one receive. At best there are only

nominal economic gains in interconnection, and full realization may be had only by permitting the pool interest to be the major one in hour-to-hour operation.

## Insull's entry into industry is commemorated

FIFTY years ago Samuel Insull, a young man from England, became Thomas Edison's secretary. The half century that lies between that event and the testimonial dinner in Chicago noted elsewhere covers virtually the whole history of the electric utility industry. It contains the life stories of a group of men who dreamed and who had the courage and the ability to give form and substance to their dreams, who translated the inventions of Mr. Edison into the present electrical industry. Insull stands in the foreground of that group.

To many thousands of people who know him only by name as a dim and distant figure surmounting an immense structure of utility and financial organizations Samuel Insull typifies what they label a "power trust." But those in the utility industry, even those who have been but distantly associated with him, and those whose minds are formed by thinking and not by shibboleths, know differently. They know that Mr. Insull, because he is a good business man, believes in low rates, that he started making rate reductions in 1912 and has continued them. They know, also, that he has kept an abiding faith with his investors — that the Commonwealth Edison Company and its predecessor companies, for instance, have not missed a dividend for forty years. To appreciate fully the significance of that statement one must have attended a Commonwealth Edison stockholders' meeting, where Mr. Insull is not discreetly applauded by a handful of capitalists, but is cheered by thousands of small shareholders who own only one, two, ten or twenty shares apiece. To him can be applied Henry Ford's remark that every man who makes money for himself must at the same time make much more for other people.

Among other milestones in the progress of the central-station industry that must be credited to Mr. Insull and his companies are: Early adoption of a large storage battery for direct-current standby; early advocacy of state utility regulation; pioneer all-steam turbine station; development of the modern electric merchandising shop; early acquisition of coal mines to safeguard fuel supply and consequently service; early interest in employee welfare as attested by establishment of service annuities and employees' savings funds, and early sale of company stock to customers and employees on the part-payment plan.

Mr. Insull is now seventy-one years old, but age does not dim his powers or restrict his activity. To him the ELECTRICAL WORLD offers its felicitations on his great achievements and on the greater ones that are to come.

## Promotional wiring costs

TO LESSEN sales resistance in home electrification some utilities absorb the cost of providing increased wiring capacity to serve heavy-duty appliances. Considerable informal discussion is being heard in the industry as to the effect of this practice on sales of ranges and water heaters, the attitude to be expected on the part of regulating commissions toward the capitalization or other accounting of these outlays, and the probable extent of its development. It is bound to become of increasing importance as the volume of household wiring and appliance sales grows in response to the stimulation of lower prices to the ultimate consumer, as the outlays made for promotional purposes expand and as the regulating commissions and operating companies encounter the question in conference or in more formal proceedings.

Expansion of the utility company's system on the customer's side of the meter crosses a deadline where a large part of the regulatory function ceases. It is questionable whether the commissions will favor capitalization of outlays for physical property beyond the meter where such boards have little or no jurisdiction over equipment performance, safety or economic factors. The test as to capitalization approval might well be the ownership of service property by the utility. This ownership might in some cases be conceded

to the utility by the customer or residence owner in writing, or, again, the zone of company ownership of installed equipment might be extended to include additional switching facilities to be included with metering equipment in a centralized control cabinet.

There is much to be said in favor of charging these costs to new-business expense or to merchandising account. If the rates do not permit their absorption in a fairly short period, it might be desirable to provide for their liquidation by the customer on a time-payment basis. In a sense these outlays encroach on working capital, which is an element of the rate base and of capital structure. There are clearly a number of questions deserving study in these aspects of intensive sales of full-household-use appliances.

## Let the South operate Muscle Shoals

THE vigorous denunciation of the Muscle Shoals bill which accompanied President Hoover's veto was apparently influential in preventing his disapproval from being overridden, and thus the issue goes over to the new Congress, probably to be nursed there for a campaign battle. The President's objections to previous proposals have been stiffened by the inclusion in the bill of indefensible measures for governmental competition with privately owned enterprise, indefensible restraints on leasing the nitrate facilities, and indefensible losses inevitable in operating an investment of $127,000,000 with an operating cost of over nine mills per kilowatt-hour in competition with utility costs of seven to ten mills in wholesale transactions. Further, the steam plant and the fertilizer plant are almost hopelessly obsolete and demand untold millions for their rehabilitation. Mr. Hoover concedes the federal government's responsibility for flood control and hydro equalization at Cove Creek.

The President is rightly skeptical of the congressional expectation that a competent board of three could be found at $7,500 a year each to manage an enterprise of this magnitude unless political advantages accruing to the managers offset the pecuniary insufficiency. And what can be the legislators' motive in excluding the operating staff from the civil service statutes?

The message contains the constructive recommendation that Alabama and Tennessee, most likely to benefit by the operation of Muscle Shoals, should set up a joint agency to lease the entire project and operate it in their own interest and that of agriculture generally. In the absence of an acceptable plan to tie this development in with existing utility interconnections which serve the entire Southeast, such a co-operative solution should largely reconcile local and national needs and obligations, prevent destructive political exploitation of an inherently non-political function and convert a noxious war relic into an agency for quiet usefulness.

## Why should sunrise cause interruption?

PLENTY has been learned lately about the interruptions that arise from lightning, but much less is known of the diverse causes of the other half of the interruptions. One investigator will soon release an extremely interesting analysis that allocates most of them to the sunrise hours, when lightning very seldom is a contributing factor.

It is probably not the direct action of the sun's rays. Birds, dew and zephyrs are stirring then, frost is thawing, expansions are coming into play, switching is being done. To ascertain the extent to which each of these influences may be a factor is likely to be as onerous a task as fathoming the interruptions from lightning. But it should be the next move in the program of superlative reliability records.

The object in disclosing this forthcoming study is to focus attention on it so that the discussion shall elicit digested experience from many sections during the intervening months. Does cloudiness or bad weather shift the band of concentration? Are migrating birds, dew, fog, frost, breeze or expansion to be blamed? Knowing more about the causes will lead to a prompter answer and an earlier remedy. More will be learned if the studies are organized now and their results contributed to the discussion.

# Poughkeepsie Plan Quintuples Domestic Usage, Tr

By ALLEN M. PERRY

*Managing Editor "Electrical World"*

**Eleven small-town customers, including three new customers in Central Hudson territory, voluntarily raised consumption from 15,502 kw.-hr. to 76,606 kw.-hr. and increased revenue from $767 to $2,365 in one year because of advantages of full-use plan.**

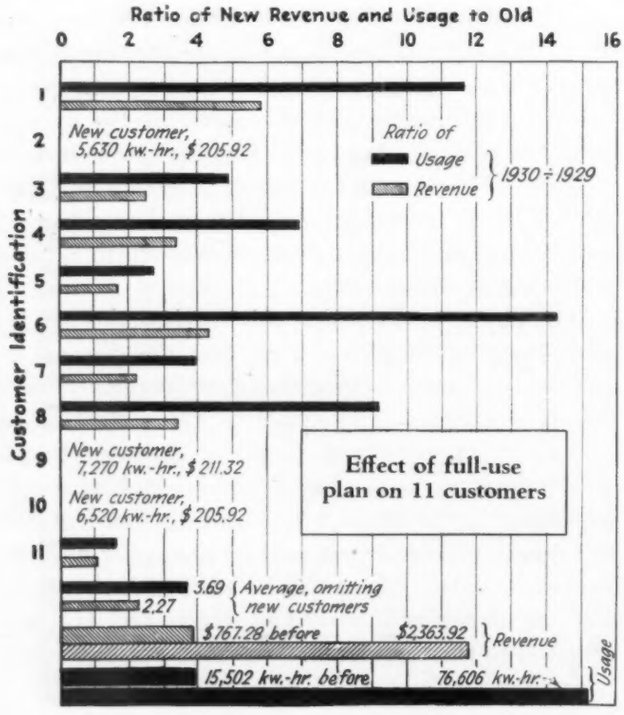
**To supplement existing uses they purchased $8,000 worth of new equipment, of which $1,100 went for installation and wiring.**

**Potential domestic market in this territory exclusive of new homes figured to be $4,500,000 for new equipment, $715,000 for additional wiring and installation, 47,000,000 kw.-hr. and $1,288,000 more energy revenue per year.**

DOMESTIC use of electricity has been nearly multiplied by five and the revenue increased three times what it was just before the "full-use" electric home plan was inaugurated by the Central Hudson Gas & Electric Corporation, according to an analysis of eleven out of twenty homes which have just completed one year's experience under this plan. In other words, these customers have changed from a limited use of electric conveniences to "full use" and obtained nearly five times as much energy as formerly for only half the unit price, including amortization of equipment cost.

The customers profited, the dealers and contractors who co-operated benefited from the sale of merchandise and wiring, the manufacturer profited correspondingly and the utility tripled its revenue.

The customers who used electricity only moderately before benefited the most. Take, for example, customers 1, 6 and 8. The first multiplied his use nearly twelve times, but paid only six times as much as before. The second multiplied his use more than fourteen times, but paid only four times as much. The third used more than nine times as much and paid about three times what he did before.




These customers did not merely receive more energy. They realized the conveniences and comforts of a "full-use" electric home, which includes, according to the designation of the Central Hudson company, a refrigerator, range, water heater, washing machine, ironer, vacuum cleaner, percolator, toaster, hand iron and waffle iron. Some of these conveniences and others were owned by these customers before the "full-use" plan became available, but the advantages of the plan induced them to complete their equipment to make a "full-use" home. The equipment used by these customers before and after the "full-use" plan is graphically presented in an accompanying chart.

The new equipment purchased by these eleven customers to supplement existing uses totaled nearly $8,000 installed, or $725 per customer, indicating the value to the dealers and the contractors who co-operated. Of this amount more than $1,100, or $100 per customer, went to contractors for additional wiring facilities and installation. Exclusive of the fifteen types of devices used by these homes, but not included in the so-called

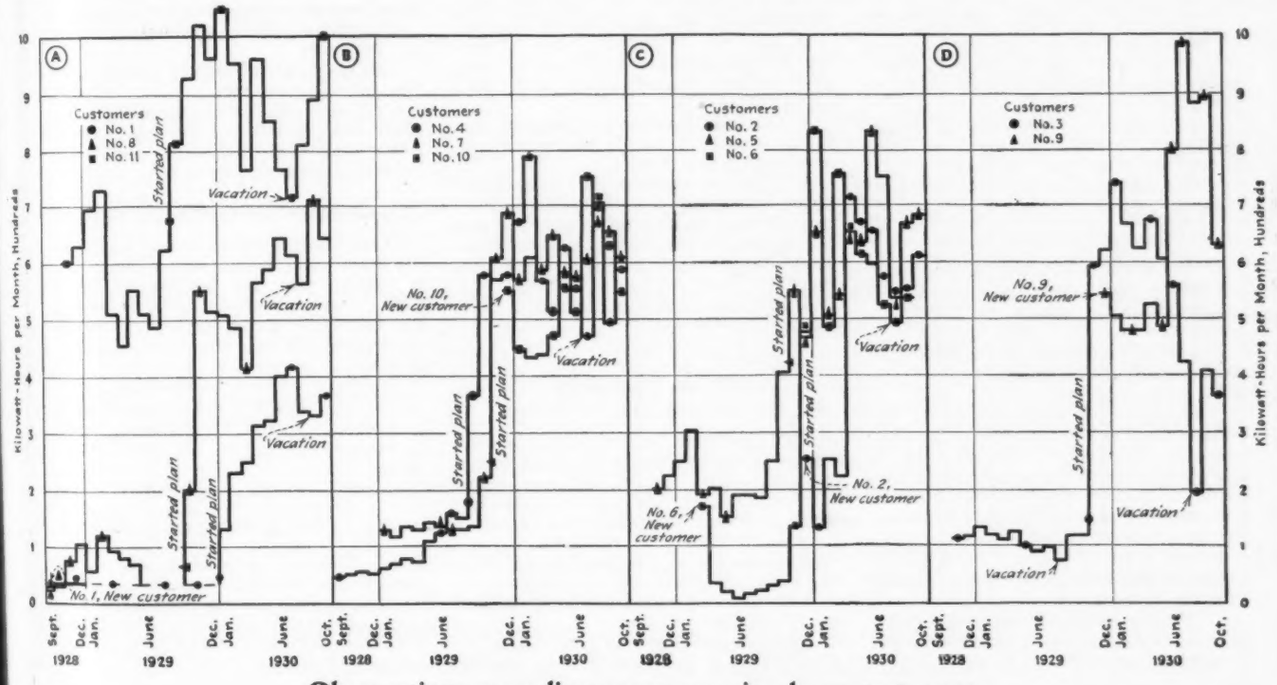
# Triples Revenue

"full-use" home, the value of electric equipment in these homes probably totals $9,500 installed, or $860 per home. Of this amount probably more than $1,300, or $118 per home, was for installation and special wiring.

Features of the plan presented from the viewpoint of the customer, dealer, contractor and utility are outlined in the accompanying panel.

As the company did not care to make a drive on the public as a whole until it had secured experience data from homes situated in urban and rural communities spread over 2,500 square miles, only about twenty homes have been encouraged to take advantage of the "full-use" plan so far. Because of the strategic distribution of these homes around the territory, they can serve as examples of what others can do. The eleven homes which have completed one year's experience with the plan are supposed to represent average homes, although some of them were already using more than the national average of energy before they were induced to try the "full-use" plan. The monthly use of energy by these homes over two years is shown graphically to indicate the effect of the "full-use" plan.

Another reason why participation has not spread readily as yet is because this is the first year that all of the direct selling of electrical appliances has been made through the dealer. These dealers have been




**Observations regarding energy use in eleven test cases**

### Chart A

Customer No. 1—After adding six pieces of equipment on plan monthly consumption stepped up cautiously, apparently due to old-time fear of bill, but attained over 400 kw.-hr. per month toward end of year.

Customer No. 8—Monthly consumption went up quickly, but with apparent caution, attaining over 700 kw.-hr. per month toward end of year, and just exceeded allowed 7,000 kw.-hr.

Customer No. 11—Added twelve pieces of equipment on plan (chiefly full use) raising his consumption to the highest of the group—10,608 kw.-hr. per year.

### Chart B

Customer No. 4—Added ten full-use devices. Former consumption was gradually increasing and attained 160 kw.-hr. After full use his usage increased in steps, attaining nearly 800 kw.-hr. per month in five months, but dropped back and rose again, consuming 7,186 kw.-hr. for the year.

Customer No. 7—Added ten full-use devices, and increased usage rapidly to a fairly uniform value, using 7,373 kw.-hr.

Customer No. 10—A new customer, when he started full use with four pieces of equipment. Caution was shown after the first month, but gradually relaxed. Due to this and failure to purchase all full-use equipment he used less than allowed 7,000 kw.-hr. by 480 kw.-hr.

### Chart C

Customer No. 2—Cautiousness shown after the first month, due apparently to the old conception of metered energy, but about the fifth month his usage increased rapidly and then diminished to about 530 kw.-hr. per month and rose again. Due to caution, he consumed only 5,630 kw.-hr.

Customer No. 5—Use was originally above the average for the country (2,749 kw.-hr. per year), but upon full use it jumped up, attaining as high as 840 kw.-hr. a month toward the end of the year and consuming 7,461 kw.-hr.

Customer No. 6—A new customer; added seven devices. His consumption during the first month of use was high, but dropped abruptly, and finally rose just before adopting full use. Then it jumped rapidly, attaining nearly 840 kw.-hr. the second month but gradually dropped down to a little over 500 kw.-hr. per month. Consumed 6,600 kw.-hr. during the year.

### Chart D

Customer No. 3—Added three devices. Prior to participation his usage hovered around 100 kw.-hr. a month, but upon embarking on full use his usage increased markedly, but dropped off. Due to caution he consumed only 6,476 kw.-hr., or 524 kw.-hr. less than allowed.

Customer No. 9—A new customer when embarking on flat rate purchased eight full-use devices and one other. His consumption hovered between 490 and 540 kw.-hr. for six months and then jumped abruptly to 990 kw.-hr., and dropped back to 630 kw.-hr. Consumed 7,270 kw.-hr.

## Features of "Full-Use" Electric Service Plan

(For details see ELECTRICAL WORLD June 7, 1930, page 1158)

### Customer's Angle

1. Can select any type or rating of refrigerator, range, water heater, washing machine, ironer, vacuum cleaner, percolator, toaster, hand iron or waffle iron (any or all) from any co-operating dealer.

2. Equipment delivered and installed without down payment or monthly installment indicated on chart, to be paid utility over period indicated (not exceeding five years).

3. Includes energy charge ($17.16 per month) and amortization of investment.

4. Allows use of 7,000 kw.-hr. per year; excess charged at 2 cents per kilowatt-hour at end of year, no refund for less usage.

5. Customer assumes servicing and replacement expense.

6. If customer moves or sells home, utility arranges to transfer obligation to new tenant.

7. At end of amortization period equipment becomes property of customer, who then pays filed rate or flat rate for energy plus yearly adjustment charge.

### Contractor-Dealer Angle

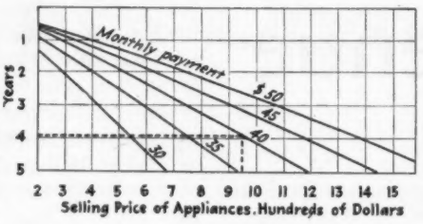
1. Any one can participate who checks customer's credit and sales quota with utility and has outside salesmen and showroom.

2. Sells direct to public without utility competition and has access to utility aids.

3. Secures cash for services and material from utility immediately upon proof of satisfactory delivery and installation. Turns over customer's time paper to utility after checking credit and receives equivalent cash minus 1½ per cent for collection risk, etc.

4. Can consult utility record of installed appliances in customers' homes as guide to sales effort.

5. Obtains increased outlet for product and services and quicker turnover of stock.




6. Receives sales aids, advertising and window display suggestions from utility.

7. See also advantages to customers.

### Utility Angle

1. Makes available to domestic customers full-use electric home without objections now raised and at attractive terms.

2. Removes objections that dealers and contractors have had to utility competition and expands their cash sales opportunities.

3. Increases revenue per domestic customer greatly at small increment cost, considering full service.

4. Finances customer's installment paper by cashing at local banks a utility note of equivalent total amount secured by customer's commercial paper or utilizes reserve funds available for investment.

5. See advantages to customers, dealers and contractors.

▼

### Market Possibilities

(in Central Hudson territory)

On basis of eleven experimental homes which are typical, each customer averaged $625 additional equipment, $100 additional wiring. Considering 47,500 electric customers in Central Hudson territory, 15 per cent pay income taxes and should be potential full-use customers, or 7,150 customers.

Additional equipment = 7,150 × $625 = $4,485,000.

Additional wiring = 7,150 × $100 = $715,000.

### Every Home a Prospect

Based on experimental homes, each averages $742 in electric equipment, excluding equipment not in full-use plan, and all necessary wiring. Therefore, each new home would demand at least $742 in electric equipment plus cost of adequate wiring. Assume rate of building of new homes and multiply by $742 plus total wiring cost = market available from new homes.

### Relative Benefits

Based on experimental homes, each old home made full use would bring the following benefits:

Dealer and manufacturer—$625 additional equipment purchased per customer.

Contractor—$100 additional wiring per customer.

Utility—$122 additional yearly revenue per old customer.

Customer—Full-use conveniences for about $35 a month for five years; after amortization only $17.16 per month plus yearly adjustment for energy.

### Disadvantages of Customary Method

If a customer wants to buy range, refrigerator and water heater under the customary plan the best terms for a $280 range (installed), $280 refrigerator and $200 water heater (installed) on the one-sale-at-a-time plan would be about:

| | Down Payment | Monthly Payment | Term, Months |
|---|---|---|---|
| Range ..... | $10 | $13.29 | 24 |
| Refrigerator | 10 | 13.29 | 24 |
| Water heater .. | 10 | 9.43 | 24 |
| | $30 | $36.01 | 24 |

On "full-use" plan could get all of these devices for $35 a month over four years, and also pay for all energy used with adjustment of 2 cents per kilowatt-hour for excess over 7,000 kw.-hr. per year.

extremely busy organizing their personnel to handle this increase in sales and some have not realized the full possibilities of this "full-use" plan to the customer or themselves.

So far only fifteen dealers have qualified to participate in the plan throughout the 2,500 square miles, nine of them being in the Poughkeepsie district.

Nevertheless, 10 per cent more units ($987,000, exclusive of radios) have been sold under the new co-operative plan, and there has been a 31 per cent increase in total domestic consumption in the past year. The saturation of different devices in Poughkeepsie (which has gas), in Millbrook (which has no gas) and throughout the system is shown in an accompanying table.

Until the plan has had a year's headway the effect on the system statistics will not be appreciable, although the average consumption per customer has already been increased from 410 kw.-hr. (before the plan) to 486 kw.-hr. at present. Revenue per customer is only $35.50 ($1 above the national average) for the following reasons:

1. Of the 47,500 electric customers, 25,000 are in gas territory having an average rate of $1.69 per 1,000 cu.ft. for cooking and $1.12 per 1,000 cu.ft. for automatic storage water heating, or for cooking and automatic storage water heating combined $1.25 per 1,000 cu.ft.

2. There is a large mountain territory, with seasonal business averaging only 398 kw.-hr. per customer.

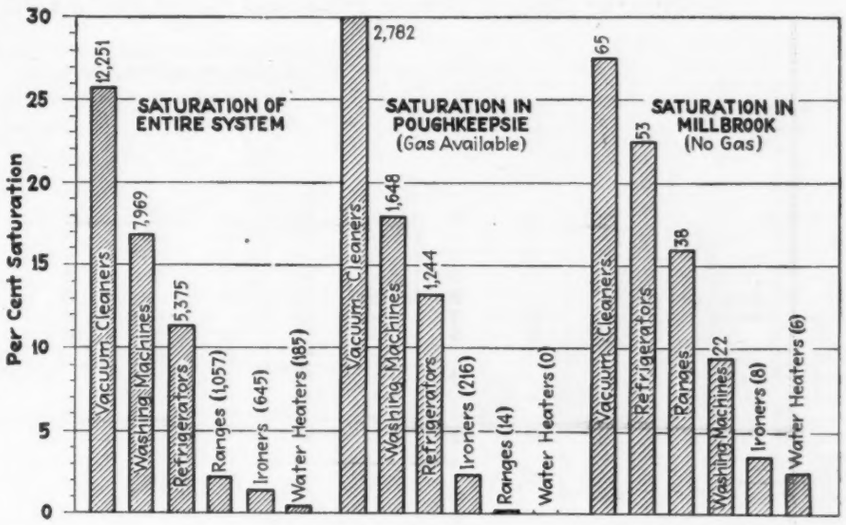
3. Only 15 per cent of the families in the territory pay income tax.

4. Several rate reductions have been made and all increment business comes on the low steps.

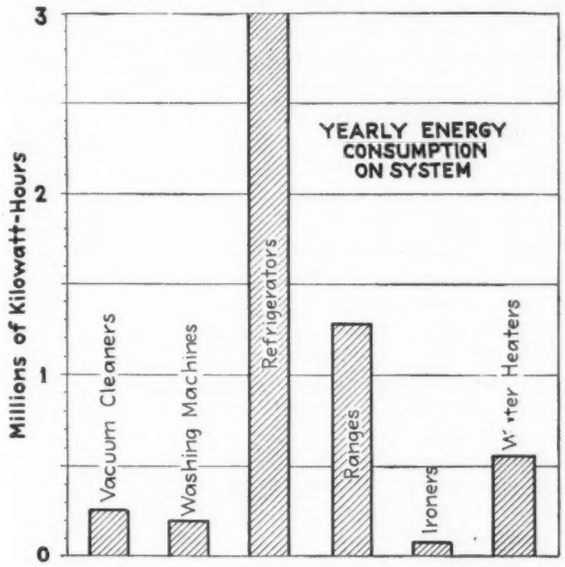
So the customers can exercise choice, the make or

rating of equipment sold to them is not controlled. Besides, the amount of the flat monthly payment and amortization period (see curve) is at the option of the customer, with yearly adjustment of energy cost protecting the utility company. The amortization period must fall within a five-year term.

The contract signed by the customer when purchasing equipment covers installation cost, amortization of the equipment cost and financing charges and is an agreement between the customer and the utility. Before it is signed the dealer checks the customer's credit with the utility and, upon proof of satisfactory delivery




**Availability of gas has largely determined saturation of ranges, water heaters and ironers**




**Refrigerators, ranges and water heaters now consume 5,000,000 kw.-hr. on Central Hudson System**

and installation, collects the face value of the contract minus 1½ per cent in cash from the utility. This contract makes provision for transfer of the customer's obligation in case he sells his home or moves.

At the end of the amortization period the equipment becomes the property of the customer, who has the option of the full-use flat rate of $17.16 per month for energy plus 2 cents per kilowatt-hour for all excess over 7,000 kw.-hr. per year, or the regular rate filed with the commission. The actual rate is not specified because the company expects, from past experience, that rates will not go up, but down, and merely referring to the filed rate is sufficient to protect the customer in case future reductions are made.

While warehousing and selling of stock to dealers was

### *System Statistics Before and After Full-Use Dealer-Co-operative Plan*

| | Per Customer Data | | |
|---|---|---|---|
| **Before plan** | Yearly | **Since plan** | Yearly |
| Kilowatt-hours | 410 | Kilowatt-hours | 486 |
| Revenue | $34.80 | Revenue | $35.50 |

### *Consumption and Revenue of Eleven Customers Before and After Full Use*

| Customer | Energy Before Adoption of Plan Kw.-Hr. per Year | Revenue Before Plan Adoption Dollars per Year | Energy After Plan Adoption Kw.-Hr per Year | Revenue After Plan Adoption Dollars per Year | Ratio of Energy Increase | Ratio of Revenue Increase | Location of Customer |
|---|---|---|---|---|---|---|---|
| 1 | 386 | $35.18 | 4,440 | $205.92 | 11.75 | 5.86 | Gardner, N. Y. |
| 2 | 0 | 0 | 5,630 | 205.92 | ∞ | ∞ | Orange Lake, N. Y. |
| 3 | 1,306 | 81.83 | 6,476 | 205.92 | 4.95 | 2.52 | Highland, N. Y. |
| 4 | 1,042 | 62.49 | 7,186 | 209.64 | 6.9 | 3.35 | Wapp. Falls, N. Y. |
| 5 | 2,749 | 119.22 | 7,461 | 215.14 | 2.7 | 1.80 | Kerhonkson, N. Y. |
| 6 | 462 | 48.05 | 6,600 | 205.92 | 14.3 | 4.28 | Coxsackie, N. Y. |
| 7 | 1,862 | 95.22 | 7,373 | 213.38 | 3.9 | 2.24 | Hurley, N. Y. |
| 8 | 769 | 60.12 | 7,042 | 206.76 | 9.2 | 3.43 | Saugerties, N. Y. |
| 9 | 0 | 0 | 7,270 | 211.32 | ∞ | ∞ | Hyde Park, N. Y. |
| 10 | 0 | 0 | 6,520 | 205.92 | ∞ | ∞ | Hyde Park, N. Y. |
| 11 | 6,926 | 264.17 | 10,608 | 278.08 | 1.6 | 1.09 | Millerton, N. Y. |
| Total | 15,502 | 767.28 | 76,606 | 2,363.92 | 4.9 | 3.08 | Includes all |
| | 15,502 | 767.28 | 37,186 | 1,740.76 | 3.69 | 2.27 | Omits new customers |

1. Based on five months' previous use. 7 and 11. Based on ten months' previous use.
2 and 9. Based on eleven months' use after plan. 1 and 6. Based on ten months' use after plan.

## *Equipment Owned Before Plan and Purchased on Plan by Eleven Customers*

● Indicates equipment originally owned.
✚ Indicates equipment purchased on plan.

| Customer Appliances | 1 | 2 New | 3 | 4 | 5 | 6 | 7 | 8 | 9 New | 10 New | 11 | Total Owned Before | Total Purchased on Plan | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Refrigerator | ✚ | ✚ | ● | ✚ | ● | ✚ | ●✚ | ✚ | ✚ | ✚ | ✚ | 3 | 9 | 12 |
| Range | ✚ | ✚ | ✚ | ✚ | ● | ✚ | ✚ | ✚ | ✚ | ✚ | ✚ | 1 | 10 | 11 |
| Water heater | ✚ | ✚ | ✚ | ✚ | ✚ | ✚ | ✚ | ✚ | ✚ | ✚ | ✚ | 0 | 11 | 11 |
| Toaster | | ✚ | ● | ✚ | ● | ● | ●✚ | ● | ✚ | | ✚ ✚ | 5 | 6 | 11 |
| Iron | ● | ✚ | ● | ✚ | ● | ● | ✚ | ● | ✚ | | ✚ | 5 | 5 | 10 |
| Vacuum cleaner | ✚ | ● | ● | ✚ | ● | | ●✚ | ● | | | ✚ | 6 | 4 | 10 |
| Percolator | ● | ● | ● | ✚ | ● | ● | ●✚ | ● | | | ✚ | 7 | 3 | 10 |
| Waffle iron | | ✚ | | ✚ | ● | ● | ●✚ | | ✚ | | ✚ | 3 | 5 | 8 |
| Washing machine | ● | ✚ | ● | ✚ | ● | | ✚ | | ✚ | | | 3 | 4 | 7 |
| Ironer | ✚ | ✚ | | ✚ | ✚ | | ✚ | | ✚ | | ✚ | 0 | 7 | 7 |
| Hot plate | | ● | ● | | ● | | | | | | | 3 | 0 | 3 |
| Water pump | ✚ | | | | | | | | | ✚ | | 0 | 2 | 2 |
| Glow heater | | ● | | | | | | | ✚ | | | 1 | 1 | 2 |
| Radio | | | ● | | | | ● | | | | | 2 | | 2 |
| Fan | | | ● | | | | | | | | ✚ | 1 | 1 | 2 |
| Sewing machine | | | ● | | ● | | | | | | | 2 | | 2 |
| Corn popper | | | ● | | ● | | | | | | | 2 | | 2 |
| Griddle | | | | | ● | | ● | | | | | 2 | | 2 |
| Soldering iron | | | | | ● | | | | | | | 1 | | 1 |
| Oil burner | | | | | ● | | | | | | | 1 | | 1 |
| Floor polisher | ● | | | | | | | | | | | 1 | | 1 |
| Vibrator | ● | | | | | | | | | | | 1 | | 1 |
| Milk warmer | ● | | | | | | | | | | | 1 | | 1 |
| Heating pad | | | ○ | | | | | | | | | 1 | | 1 |
| Ventilator | | | | | | | | | | | ✚ | | 1 | 1 |
| Total | 12 | 12 | 15 | 10 | 16 | 7 | 17 | 7 | 9 | 4 | 12 | 52 | 69 | 121 |

**Average Unit Costs Installed Based on Actual Purchases**

| Equipment | Equipment Cost | Wiring Cost | Equipment | Equipment Cost | Equipment | Equipment Cost |
|---|---|---|---|---|---|---|
| Refrigerator | $272 | $12.50 | Ironer | $47 | Toaster | $81 |
| Range | 180 | 60 | Vacuum cleaner | 63 | Irons | 6 |
| Water heater | 202 | 32 | Percolator | 17 | Waffle irons | 13 |
| Washing machines | 80 | 10 | | | | |

embodied in the original plan, the utility has discontinued this practice because it finds dealers can obtain as good prices as the utility, considering the latter is compelled to include a handling charge of 17 per cent. Discontinuance of the original warehousing practice also brings the jobber into the picture. Attempts are being made to show him that if he will not insist upon 25 per cent handling charge, the volume of business may be such that even though the unit profit is smaller, the total net revenue will be larger. Some of the manufacturers still have to be convinced of the logic of this argument.

While the utility does not do direct selling any longer, sales advisers to dealers are maintained on a salary of $300 to $400 per month, plus or minus 50 cents for every 1 per cent increase or decrease of kilowatt-hours from the budget for residence sales.

Wiring and installation of customer's equipment are handled by negotiations between the co-operating dealers and the contractors, the price being included in the customer's flat rate. Both the dealer and contractor receive cash from the utility upon proof of satisfactory installation.

Range installations so far have averaged $60 per unit, although the actual cost of each job may vary on each side of this figure, depending on the location of the range with respect to the house load center. With a range installed, the cost of wiring and installing a water heater varies from $5 to $10.

So far the dealers are selling domestic equipment chiefly at list prices, although it appears that they should be able to sell at 10 per cent below list under the "full-use" plan and still make a profit because of the volume of business which may be stimulated by this new plan. Utility showrooms are used by the dealers for demonstrating their own stock.

Although the plan originally provided for selling time paper to banks (see outline of plan) the Central Hudson Gas & Electric Corporation right now is carrying the time paper itself due to reserve funds available for investment. Furthermore, the bonus originally contemplated for each full-use home sold by dealers has been discontinued, the utility believing that it is better to spend the equivalent amount in promotion of the plan. Instead of absorbing the range and water heater installation expense in sales expense, as might be justified in a pioneering venture, the equivalent is being spent in teaching housewives how to cook electrically.

For a matter of comparison, let us assume that there was no gas competition and that all of the families paying income taxes were to purchase full-use devices under this plan; i.e., 15 per cent of the 47,500 customers in the Central Hudson territory can be induced to come on the "full-use" basis and the averages of the eleven test cases are applied, there should be an immediate potential market, exclusive of new homes, for $4,500,000 in domestic equipment and about $715,000 for associated wiring and installation. If the average consumption of

these 7,150 homes was to be 410 kw.-hr. per year. experience indicates that they would each increase consumption about 6,550 kw.-hr. per year and cause an increase in annual consumption of about 47,000,000 kw.-hr. On the basis that they averaged $35.50 per year revenue apiece before participation in the "full-use" plan, they would average $215 under the plan and bring in $1,288,000 more energy revenue per year.

E. R. Acker is general commercial manager of the Central Hudson Gas & Electric Company.

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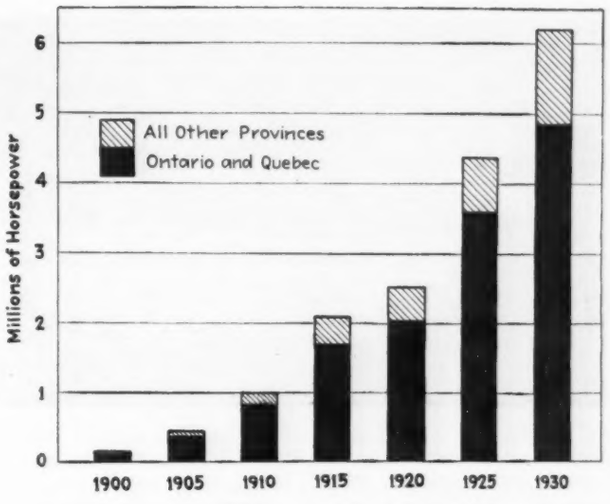
# Canada Has 6,125,000-Hp. in Hydro Plants

Water-power development was maintained at a high level throughout Canada during 1930, both in the construction of new plants and the extension of existing ones, according to the annual statement of the Minister of the Department of the Interior. New installations brought into operation during the year aggregated 397,850 hp., bringing the total installations for the whole Dominion to 6,125,000 hp. at the end of the year. Construction is active at present on a number of undertakings, several of which are of outstanding magnitude, and with the completion of these during the next two or three years more than 1,500,000 hp. will be added to the Dominion's total. Other important projects are under active investigation, with developments apparently imminent in several cases, while plants recently placed in operation or actively under construction are designed for future extensions as load conditions warrant.

During the year the Province of Ontario led in new installations placed in operation with a total of 136,000 hp., followed by Quebec with 122,700 hp., British Columbia 71,000 hp., Saskatchewan 42,000 hp., New Brunswick 21,000 hp. and Nova Scotia 5,100 hp.




**1900, 173,223 hp.; 1930, 6,125,000 hp.**

Major new construction completed during the year or now in progress for early completion is summarized in the accompanying table. In Ontario the Queenston plant, the largest single generating station in Canada, is now at its full designed capacity of 560,000 hp. The Abitibi development, by a subsidiary of the Abitibi Power & Paper Company, is to have a head of 237 ft.

In Quebec, in addition to the new power installations actually placed in operation, there are developments of outstanding importance under active construction, involving an initial installation of 805,000 hp. and final installed capacity of 2,013,000 hp.

The Shawinigan Water & Power Company has completed a new storage reservoir of 33,000,000,000 cu.ft. at Taureau Rapid on the Mattawin River, and to use the additional water thus provided has completed the installation of another 25,000 hp. unit at Grand'Mere. while one of 30,000 hp. is being added at the La Gabelle plant to be ready next spring.

## *Major Developments Completed or in Progress*

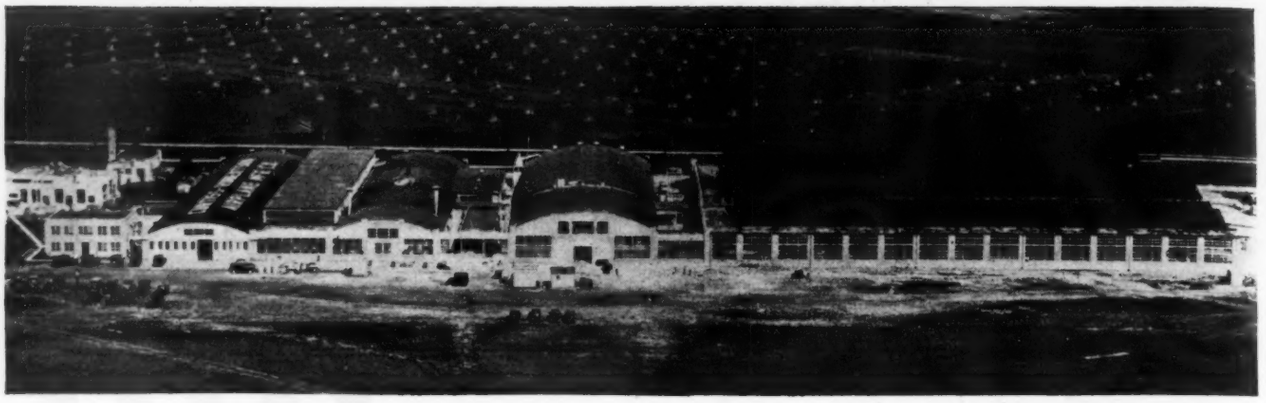
**Projects Under Construction, with Date of Prospective Operation**

| Company | Station or Site | New Plants, Hp. | Ultimate Rating, Hp. | Year of Initial Operation |
|---|---|---|---|---|
| **British Columbia** | | | | |
| Bridge River Pwr. Co., Ltd. | Bridge River | 56,000 | 600,000 | 1932 |
| West Kootenay Power & Light Co. | Corra Linn (Kootenay R.) | ..... | 57,000 | .... |
| **Manitoba** | | | | |
| Northwestern Power Co. | Seven Sisters (Winnipeg R.) | ..... | 225,000 | .... |
| Winnipeg, City of | Slave Falls (Winnipeg R.) | 24,000 | 96,000 | .... |
| **Ontario** | | | | |
| Hydro-Electric Power Commission, Ottawa Valley Power Co. | Chats Falls (Ottawa R.) | 224,000 | 280,000 | .... |
| Ontario Power Service Corp., Ltd. | Canyon (Lower Abitibi R.) | ..... | 333,000 | .... |
| **Quebec** | | | | |
| Alcoa Power Co., Ltd. | Chute-a-Caron (Saguenay River) | ..... | 260,000 | 1931 |
| Beauharnois Power Corp. | St. Lawrence River | 200,000 | 500,000 | 1932 |
| Shawinigan Water & Pwr. Co. | La Gabelle (Mattawin R.) | 30,000* | ..... | 193 |
| | Rapide Blanc (St. Maurice River) | 160,000 | 240,000 | 1932 |
| Maclaren-Quebec Pwr. Co. (projected) | Buckingham (Lievre R.) | ..... | 120,000 | .... |

*Added to existing plant.

**Additions During 1930**

| Company | Station or Site | Added to Existing Plants, Hp. | Installed in New Plants, Hp. | Ultimate Rating, Hp. |
|---|---|---|---|---|
| **British Columbia** | | | | |
| Northern British Columbia Power Co. | Falls River | ..... | 6,000 | ..... |
| Vancouver Island Power Co. | Jordan River | 18,000 | ..... | ..... |
| Western Power Co. of Canada, Ltd. | Ruskin (Stave R.) | ..... | 47,000 | 188,000 |
| **Ontario** | | | | |
| Algoma District Power Co. | High Falls (Michipicoten River) | 11,000 | ..... | ..... |
| Canada Northern Power Co. | Upper Notch (Montreal R.) | ..... | 13,000 | ..... |
| Hydro-Electric Power Commission | Queenston (Niagara R.) | 58,000 | ..... | 560,000 |
| Thunder Bay System (H.E.P.C.) | Alexander Landing (Nipigon R.) | ..... | 54,000 | 54,000 |
| **Quebec** | | | | |
| Maclaren-Quebec Power Co. | High Falls (Lievre R.) | ..... | 90,000 | 120,000 |
| Shawinigan Water & Power Co. | Grand'Mere (Mattawin R.) | 25,000 | ..... | ..... |



*Twice in less than three years this airplane factory has practically tripled in size*

# Flexible Distribution Meets Problematical Growth


## By BENJAMIN F. THOMAS, Jr.

*Consulting Engineer, St. Louis, Mo.*


**Large size of units produced demands proportionately large working areas.**

**Practically all of the assembly is hand work, in which great skill and meticulous care must be exercised; requires good lighting and abundant provision for portable power tools.**

**The possibility that the factory that is ample in size today may be wholly inadequate tomorrow necessitates an extreme flexibility of the power supply arrangement.**

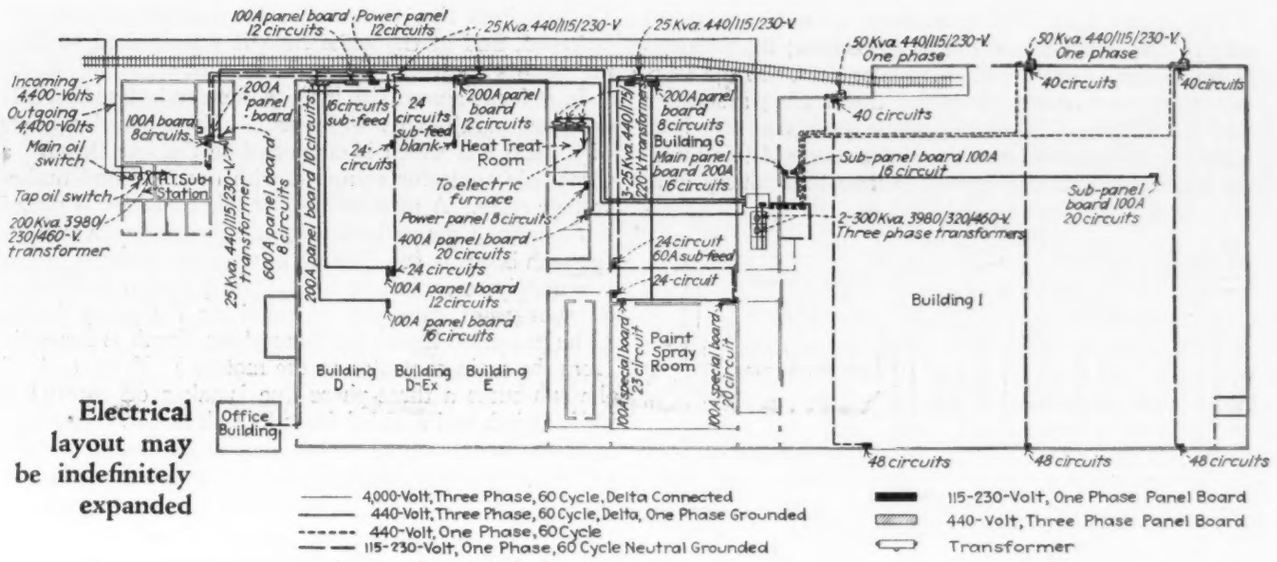
THE original plant of the Curtiss-Robertson Airplane Manufacturing Company, located on the north side of the St. Louis municipal airport at Robertson, Mo., consisted of a machine shop and assembly building, 60 ft. wide by 240 ft. long, and a woodworking building about 60 ft. wide and 40 ft. long. Before the end of the year 1928 the floor space under roof had been increased from the original 17,000 sq.ft. to 48,000 sq.ft. by extending the woodworking building to a length of 240 ft. and by putting up building "G," 80 ft. wide and 240 ft. long. In the spring of 1929 work was started on a new construction program that nearly tripled the size of the plant. A new building, 300 ft. wide by 240 ft. deep, was constructed and the 40-ft. space between the two original buildings, each 60x240 ft., was roofed over, making one large building, 160x240 ft. Further growth of the plant is anticipated.

The entire plant has been carefully planned to secure the maximum of production. The material flows to the assembly line along which the ship progresses in systematic order from the initial stages at the west end of building "D" until the completed ship is rolled out of the east door of building "I" onto the concrete apron, where the gasoline and oil tanks are filled and it is given a test flight.

Three-phase, 60-cycle, 4,400-volt service is purchased from the local utility company. The original installation was one 100-kva., three-phase transformer; later a second transformer of the same capacity was added. The transformers were connected delta-delta and the 440-volt, three-phase secondary line ran to the main distribution panelboard of 600 amp. capacity.

During the summer of 1929 the entire electrical system was redesigned and reconnected in order to fit in with the extensions being made. Circuits were changed from one panelboard to another to distribute the loads more evenly and more panelboards were added in the existing buildings to care for the new circuits.

The power system is three phase, with one phase permanently grounded at the transformers. The lighting system is 110-220 volt, single phase with grounded neutral and is fed from 440-volt to 220-110-volt, single-phase transformers. In the original plant all of the lighting circuits had been 110 volts, two wire, but in the new additions all single-phase circuits are 110-220 volt, three wire, with lamps and outlets evenly divided on each side



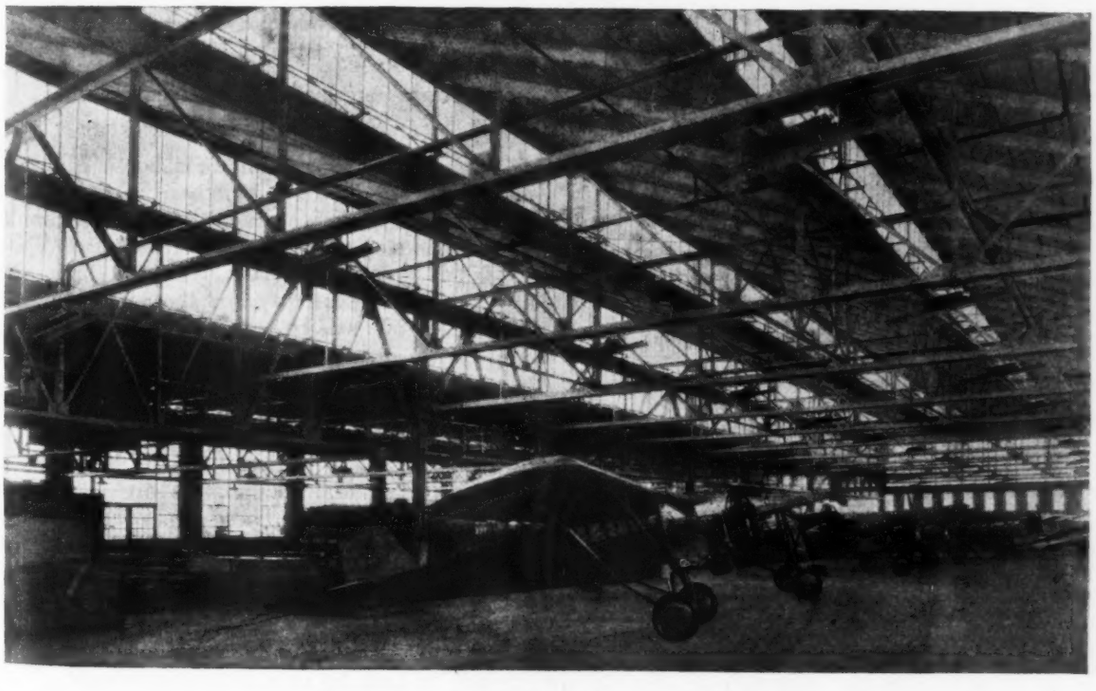

**Electrical layout may be indefinitely expanded**

of the neutral. The neutral wire is run full size and a saving of 25 per cent in copper was effected.

All wiring is in rigid conduit and the wiring under the floor is lead-covered cable. Wire sizes were calculated to give a maximum drop of only 2 volts from panelboard to outlet, requiring No. 10 wire on many of the runs.

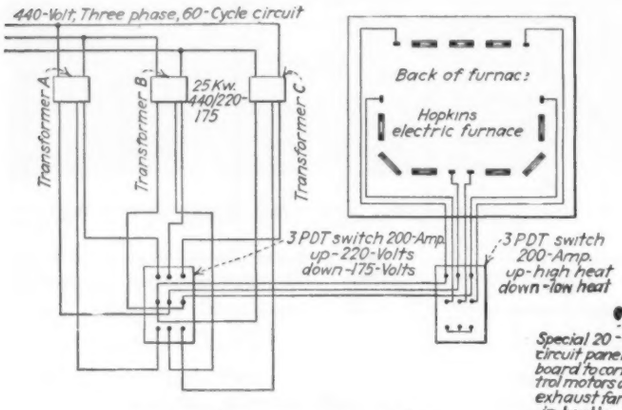
The connected load in the plant was more than doubled. In the new assembly building, "I," the added lighting load is 80 kw. All outlets for factory lights are wired for 500 watts each, the outlets in the locker and wash rooms for 100 watts each. In the offices on the balcony at the west end of the building the outlets are wired for 200 and 300 watts. Floor outlets for portable tools and lights are provided throughout the entire building. Every 20 ft. a row of four outlets per bay, or twelve across the building, are wired for 500 watts each. About every 20 ft. around the outer walls single convenience outlets are provided and on each interior column a group of four outlets is placed. In all, there are 198 outlets for lights and 238 outlets for portable tools, lights, etc., making a total connected load of 199 kw. All of this load is 110-220-volt, three-wire, single-phase grounded neutral service.

The illumination throughout all the new buildings averages about 8 foot-candles, somewhat higher than in the older parts. In building "I" Cooper-Hewitt mercury-vapor lamps of 450-watt rating are installed in the two bays where the assembling is done. These lamps were selected because of the uniform illuminating qualities and lack of sharply defined shadows. They have proved to be very satisfactory. In the north bay, which is occupied by storerooms and bulk storage, 300-watt lamps in RLM dome reflectors are installed.



**Where the planes are put together**
(Building I)

The power load in this building consists at present only of the unit heaters, ten 3-hp. motors; the fourteen 7½-hp. motors operating the ventilator sash, and the 3-hp. motor on the vacuum pump for the heating system; a total of 138 hp. However, ample provision has been made for future requirements, if the status of this building is changed and it is desired to install machinery in it.



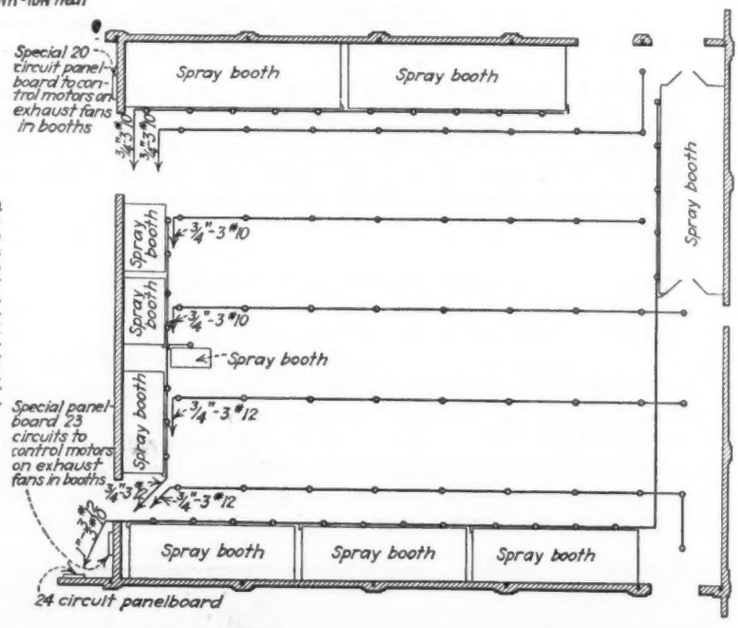

**Control arrangement for heat-treating furnace**

This furnace is used to anneal steel, duralumin and other alloys. The maximum rating of the furnace is 80 kw., at which input the temperature will be about 1,600 deg. F. The heating elements of the furnace are so arranged that they may be connected either in delta or star. The operating voltage is 220 and the furnace is fed through a separate bank of three 25-kva. transformers, connected delta-delta; each transformer has a special tap on the windings to give 175 volts. Two three-pole, double-pole switches are used in connecting up the transformers to the heating elements, and by the different positions of these switches four heats may be obtained with four different power inputs.

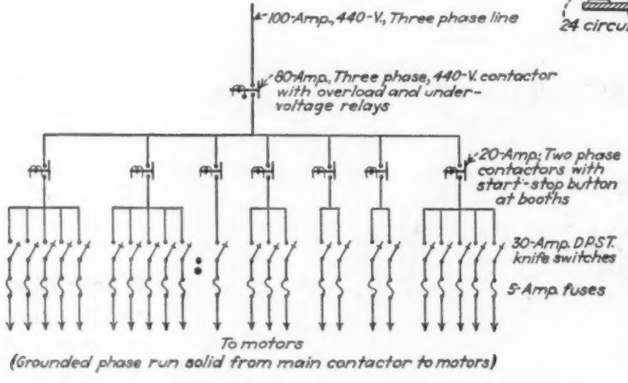
Underwriters that each motor be separately fused and switched, and at the same time it was desired to have the motors controlled from the booths.

In order to accomplish both of these ends, two specially designed panelboards were built. Each board consists of a main bus which is connected to the line through a three-pole contactor equipped with overload and under-voltage relay. A reset switch for this contactor is placed in the trim of the cabinet. From this main bus a sub-bus for each booth is fed through a two-pole contactor which is remotely controlled by an operating button inclosed in a vapor-proof case and mounted on the spray booth. (The grounded leg of the three-phase circuit is run solid from the main contactor to the motors.) From each of the sub-buses a three-phase line is taken off through a knife switch and a set of fuses to each motor.

With this arrangement, any number of fans in a booth can be operated and controlled from the booth itself. If




**The spray room required special treatment**


100-Amp., 440-V., Three phase line
60-Amp., Three phase, 440-V. contactor with overload and under-voltage relays
20-Amp. Two phase contactors with start-stop button at booths
30-Amp. D.P.S.T. knife switches
5-Amp. fuses
To motors
(Grounded phase run solid from main contactor to motors)

**Control scheme for spray booth exhaust fans**

In the paint spray rooms vapor-proof conduit, switches and fixtures were used because the pyroxoline lacquer spray used is very inflammable and explosive. All spray booths are equipped with exhaust fans, ranging from one to seven per booth. There are 43 exhausters in all, having a total capacity of 170,000 cu.ft. of air per minute. Each is equipped with a 1-hp., three-phase, 440-volt squirrel-cage induction motor. It was required by the

the work requires only three fans in a booth equipped with five exhausters, the knife switches on two motors can be opened at the panelboard and the three remaining motors started and stopped at will from the booth. While the cost of this arrangement was relatively high, the saving in energy will soon pay for the increased cost because the operators will be more careful in stopping the fans when not in use than if they had to go to the panelboard outside of the room to throw the switch. Two of these boards were built and installed on the wall outside of the spray room; one board has a capacity of twenty and the other of 23 circuits.

The outlets for general illumination are spaced on 10 ft. x 13 ft. 4 in. centers. These lights are 200-watt RLM dome vapor-proof reflectors. The lights for the spray booth illumination are 200-watt vapor-proof angle reflectors, so hung that the light is reflected into the booths. These lights are spaced approximately 6 ft. 6 in. along the top of the booths. The wiring puts five lights, or 1,000 watts, on each leg of a three-wire circuit. The

panelboard for the lights is outside of the room. Vapor-proof switches for the booth lights are placed at one end of each booth so that they may be readily controlled by the man at the booth, but the ceiling lights are switched only at the panelboards.

### Electric substation

The growth of the plant had been so rapid that, with the anticipated future requirements in mind, it was decided to design the substation of ample size. It is located in the space between buildings "G" and "I," where it will be near the center of the load when the further anticipated extensions are made. It is of the outdoor type. Two 300-kva., three-phase transformers were installed and space was provided for a third transformer of the same size, though one of 500 kva. can be placed there if needed. The high- and low-tension buses are supported on pipe framework above the transformers. The low-tension bus is carried through the wall of a small room at the north end of the substation inclosure which contains the main switchboard for the entire plant. The main circuit breaker on this board is of the air-break type with a maximum rupturing capacity of 2,250 amp. From this board feeders are run to the various panelboards throughout the plant and to the 110-220-volt transformers for the lighting circuits.

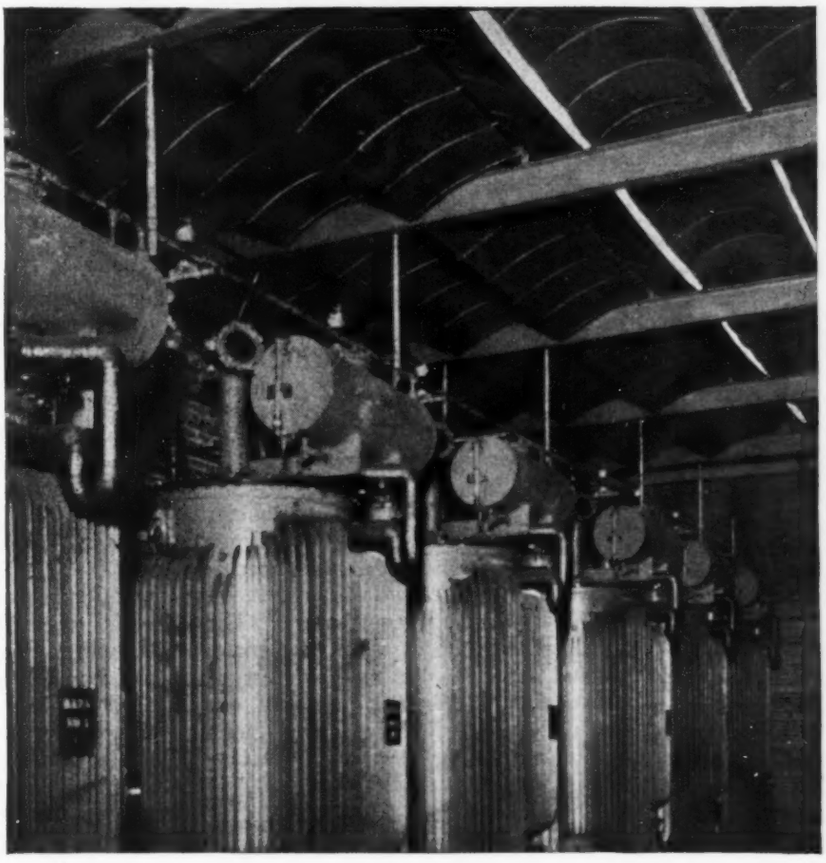
With the extensive additions, the Fire Underwriters insisted upon the installation of automatically operated fire pumps to supply the fire lines. Two pumps, each having a capacity of 1,000 g.p.m. and directly connected to a 100-hp., three-phase, 440-volt induction motor, were installed. The Underwriters' regulations required that these pumps be fed through separate transformers and not through the transformers for the industrial load and that the switching arrangements be such that the entire industrial load can be disconnected in the event of a fire of major proportions, so that the capacity of the incoming line may be reserved for the fire pumps. This necessitated a second substation, which was placed in a room in the brick service building which also houses the fire pumps. This substation was made the primary metering station. The utility company's meters are placed on the switchboard in this room. Space was also provided here for the installation of a 300-kva. transformer for the industrial load if the occasion for this additional capacity arises in the future.

All electric energy is bought from the Union Electric Light & Power Company. The Curtiss-Robertson company purchases its power requirements under the wholesale untransformed rate at the primary voltage and has to provide the transformers necessary to step down this voltage to 440. However, under a comparatively new schedule, the utility company can build the necessary transformer substation and rent it to the consumer. Under the conditions of operation at the Curtiss-Robertson plant and with the large anticipated growth of load it was more desirable to rent the substations at an annual rental of 15 per cent of cost, than for the company to put in its own substations. The original cost would be approximately the same in either case and the carrying charges of the company-owned equipment would equal the 15 per cent rental charged by the utility company. The freedom from maintenance troubles, aside from their cost, is worth something, and the fact that no capital outlay was necessary were influential factors in the determination to rent rather than own the substations.

▼

## Transformer Hum Absorbed by Deadening Roof

In detached substation buildings it is possible sometimes by means of a simple application of sound-deadening material to the ceiling of the transformer room to reduce the hum of the transformers to a pitch so low that it cannot annoy the neighbors. The installation shown is in a residential area substation of the Commonwealth Edison Company, Chicago.



# Politics Always Makes a Mess


## By EDWIN GRUHL

*Vice-President and General Manager*
*North American Company, New York*

THROUGHOUT our history it has been necessary to debunk politics.

You are familiar with the situation at Muscle Shoals. The government there spent more than $68,000,000 on two nitrate plants, involving processes which are now as obsolete as the proverbial dodo. It spent nearly $56,000,000 in the construction of the gigantic Wilson Dam, which, under present conditions of stream flow, is capable of producing less than 100,000 hp. To remedy this lack of firm capacity it is now proposed to build other dams and improve headwaters at an expenditure of another $83,000,000, making a total investment in Muscle Shoals of more than $207,000,000. The total receipts from the sale of power at Muscle Shoals from September, 1925, to June 30, 1929, amounted to a little more than $2,600,000, against which must be charged direct operating expenses of more than $750,000. The return to Uncle Sam during the nearly four years was less than $2,000,000 on a direct investment of nearly $56,000,000, or less than 1 per cent per annum. This investment does not include any value for the site of the Wilson Dam, which was deeded to the United States government by the Alabama Power Company during the war for one dollar. It is no wonder that President Coolidge said: "If anything were needed to demonstrate the almost utter incapacity of the national government to deal directly with an industrial and commercial problem it has been provided by our experience with this property. We have expended vast fortunes, we have taxed everybody, but we are unable to secure results which benefit anybody."

### Boulder Dam

Recently the Commissioner of the Bureau of Reclamation, Elwood Mead, told the students of the Massachusetts Institute of Technology about Boulder Dam: "It is an enterprise which carries a challenge to the engineer, no matter where he lives. The specifications just issued have been awaited with intense interest by both the profession and by contractors. The manner in which they deal with the obstacles of climate, of location, of size and stresses, was an acid test of the ability of the Reclamation Bureau to carry out monumental undertakings in its field."

You engineers are familiar with the risks to the taxpayers' money involved in developing these superlative dimensions. There are temperatures of 110 to 115 deg. in the shade. There are velocities of the river's flow of 20 ft. a second. There have been extraordinary floods. There are tremendous stresses to be accounted for in masonry higher than the Washington Monument. You know that these stresses are to be met by a concrete structure, contrary to the advice of General Goethals, builder of the Panama Canal, who stated: "When you get to concrete, and get putting in concrete in big masses, you are not always sure of your mix; you are not always sure of your foremen laying the concrete at the proper time; you are running into uncertainties that, with the internal stresses of the dam, make me prefer a rock-filled dam, under conditions such as exist at Boulder Canyon, rather than a concrete dam."

We do not know what this Boulder Dam project is going to cost. In 1926 we were told by the Department of the Interior that, "as the result of long and painstaking studies," the estimate of the financial working would be $125,000,000. Two years later the specially appointed Colorado River Board estimated the cost would be $165,000,000. The bill which became law on December 21, 1928, authorized the appropriation of this amount. In his recent talk at the Massachusetts Institute of Technology Commissioner Mead stated that "it will cost more than $200,000,000." And remember that the bids are not yet in.

He points out, however, that the law required the Secretary of the Interior to enter into contracts which, in his opinion, will return within 50 years all the money spent on the dam plus 4 per cent interest, and within 40 years, without interest, all the money spent on the

**Excerpts from "Yardsticks," an address by Mr. Gruhl as a vice-president of N.E.L.A., before the recent power systems engineering committee of that organization in St. Louis.*

# of Business*

All-American Canal, and he estimates that the power and water income from the contracts "will be $66,650,000, which will be the net profit of the government for going into this enterprise, to be disposed of as Congress may hereafter direct."

The estimates of revenue are based upon contracts for "falling water" at 1.63 mills per kilowatt-hour for the power privilege. Dr. Mead states: "Those who pay this price will have to install and operate the machinery. It is simply a means of fixing the price to be paid for falling water, with the government having nothing to do with the generation of hydro-electric energy. . . . This price will make the cost of Colorado River power delivered in southern California somewhat greater than the present cost of generating power in the vicinity of Los Angeles by oil or natural gas, but all are agreed that this latter cost is likely to increase."

The tremendous supply of cheap natural gas in California, of recent discovery, is more important to that state than the discovery of gold and renders the project economically obsolete before its construction is even started.

### Reclamation monuments costly

What assurances have we that the Bureau of Reclamation is competent, as Dr. Mead states, "to carry out monumental undertakings in its field"? The bureau has expended huge amounts of government money upon many large projects over a long period. The plan of providing money to be repaid by the beneficiaries is similar to plans under which the other monuments of the Bureau of Reclamation have been developed. Instead of the government getting its money back in ten years, as contemplated by the reclamation law of 1903, or in twenty years, as amended in 1914, it now contemplates reimbursement in 30 years in only five out of twenty-two of these monumental reclamation projects. The majority of the projects are operated under either of two plans, in which the money is to be returned in 40 years, or over an indeterminate period depending upon the crop production, the amount to be paid being 5 per cent of the average annual gross for the preceding ten years.

According to testimony before the House appropriations committee, it is estimated that the government will get its money back on several projects in periods of more than 70 years each. It should be remembered that these advances carry no interest, and of course there is no incentive for early payment. Since 1903 government reclamation work has cost approximately $230,000,000. It has definitely written off almost $15,000,000 in losses and the reports of the bureau estimate and admit an additional loss of $13,000,000. Only $32,000,000 has been repaid by settlers and nearly $120,000,000 is still owing Uncle Sam on these so-called self-sustaining projects, and more money is constantly being appropriated for their completion and improvement.

It is not necessary to confine our attention to the Bureau of Reclamation to portray the yardsticks of inefficiency and extravagance exhibited by Uncle Sam in business. For years the rivers and harbors appropriations have been referred to as "the pork barrel."

Extravagances permitted under these appropriations have been notorious. It was felt that with the appointment of a National Rivers and Harbors Commission the work might be limited to enterprises of some merit. The call for a meeting sent out by the National Rivers and Harbors Commission on December 4, 1930, explains the present situation: "After three years of delays and disappointments, the friends of waterways were delighted by the passage of the greatest river and harbor program ever engaged in in this or any other country. This notable bill adopted 177 new projects upon which there was authorized the immediate expenditure of nearly $144,000,000 and an ultimate expenditure of between $350,000,000 and $400,000,000. . . . The necessary indispensable next step is to have the appropriation for the coming fiscal year increased to $75,000,000 or $80,000,000. There are no valid reasons for, but many reasons against, an interval of two or three years for the passage of such bills. Congress should definitely adopt the policy of annually appropriating for rivers and harbors all that can be wisely expended by the army engineers."

When the last river and harbor bill was up for debate Congressman Freer of Wisconsin called attention to a branch of the Missouri River on which some $5,320,000 had already been expended, and an appropriation of $9,000,000 was being asked for in the bill. The total commerce on that particular branch, as reported by the survey, was 169,000 tons. More than 168,000 tons consisted of such items as piling for river work, trees for river work, sand and stone for river work, coal for river work, concrete for river work and machinery for river work, while the actual commerce was 277 tons, and out of that it appeared, on further investigation, that 75 tons were logs actually floated on the stream.

It cost Uncle Sam $3,000,000,000 to build a shipping fleet. After losing more than $100,000,000 a year in operation, $2,700,000,000 of the original investment was wiped out and now about $150,000,000 remains of nearly a $4,000,000,000 investment.

### Government railroading a fiasco

The government loss in the two years and eight months in which it undertook operation of the railroads exceeded $1,500,000,000, and this is only a small part of what government operation cost the American people. Before they were taken over by the government the railroads were paying a moderate return on an investment of $18,000,000,000 with rates that yielded 7.15 mills per freight-ton-mile and 2.09 cents per passenger-mile. Under government operation the average rates increased to 12.84 mills per freight-ton-mile and 3.142 cents per passenger-mile. The difference in operating revenues was $2,475,000,000, at least half of which might have been saved under private operation.

We have an illuminating comparison of the costs of government and private operation in our navy work. The United States Navy decided to test navy yard construction with private construction. The sister battle-

ships *Connecticut* and *Louisiana* were laid down at the same time, the *Connecticut* in the New York navy yard, which had been specially prepared for the test, and the *Louisiana* in a private shipyard near New York. The *Louisiana* was completed and commissioned four months earlier than the *Connecticut* at a total cost of $6,065,531, out of which the shipbuilder had to pay taxes, insurance, maintenance of his yard and overhead. The *Connecticut* cost the government $7,800,234, or $1,734,693 more than the *Louisiana*, and the navy yard did not pay taxes or insurance and had no charges for yard maintenance or other overhead in its cost accounting.

As George E. Roberts pointed out, in commenting upon the government navy yards, arsenals, gun works, printing offices and mints, none is a model industrial establishment. He stated: "None of them could make its expenses in competition with privately owned rivals. Modern machinery has been deliberately kept out of government establishments by acts of Congress in order to keep more employees on the payrolls."

## Postal deficits

The Post Office deficit for the fiscal year 1930 is reported at more than $98,000,000, as compared with $88,000,000 for the fiscal year 1929. Of this amount, according to the cost ascertaining report, some $90,000,000 is from the handling of second-class matter; that is, publications, including newspapers. About all the remainder of the deficit arises from franked and free services. A long list of Postmasters-General have pointed out the losses which were encountered in handling second-class matter. As Frederic A. Tilton, Third Assistant Postmaster-General, has stated, "The fact remains that the Congress in its last major rate revision, May 29, 1928, in the face of settled precedents as to classifications and theoretical losses appearing in the annual cost ascertainment reports, revised second-class rates downward. Was this for a political or an economic reason?"

Nor need we confine the record to the federal government. Many instances of the costly errors in judgment may be found in the undertakings of our state governments. The records show the utter inability of state-conceived enterprises to adapt themselves to changes in economic conditions. They all show inefficiency in operation, extravagance in capital expenditure and utter disregard of the taxpayers' interests in the staggering funded debt created to further them.

W. J. Hagenah has compiled an impressive list of the failures by states which have yielded to government ownership. As he states: "For almost a hundred years there has nearly always been some state ready to yield to the succeeding waves of government ownership sentiment as an easy road to relief from every business problem. First, it was state banks that were to provide ample credit facilities when economic principles forbade such steps from a sound business standpoint. Then it was public excitement for state canals and turnpikes, the ruins of which still remain in many states. Next came the political urge to build state railroads, or the lending of public credit to stimulate railroad construction, long in advance of business needs. More than $88,800,000 of state bonds, issued for the financing of these projects and sold to innocent purchasers, have been repudiated with no other excuse than that the schemes were failures." The states of North Dakota and South Dakota, after amending their constitutions to permit the states to go into various businesses, expecting to solve their agricultural problems, increased their state indebtedness within ten years nearly $94,000,000 and raised the local per capita tax burden to the highest in the United States.

## New York Barge Canal losses

The New York State Barge Canal project down to 1902 failed to pay for itself by approximately $73,000,000. The canals were then rehabilitated and the State of New York created bonded indebtedness for that purpose from 1903 to 1914 aggregating more than $154,000,000. Governor Smith in his 1925 message to the New York Legislature quoted the total cost from 1905 through June 30, 1924, at $231,000,000. To date the total cost to the State of New York of its barge canals has been estimated at $346,000,000. As was pointed out in a special report submitted to Governor Smith on February 26, 1926, by the State Superintendent of Public Works, "The traffic carried on the Barge Canal has fallen short of expectations. It is now floating only about one-tenth of its tonnage capacity. The net cost of the canal to the taxpayers in 1925 was $10,000,000. It would have been cheaper for the state if all the freight carried on the canal had been put in railroad cars and the state had paid the freight bills." So burdensome had this white elephant become that New York has proposed to turn the whole project over to the federal government free of cost, the canal to be maintained and operated by the United States in the future. The people of New York state must, of course, continue to pay the interest on, and eventually retire, the $151,000,000 of canal bonds still outstanding.

What is the fundamental reason for such a universal record of failure of government-conceived engineering projects? In his public speech before the Civitan and other United Service clubs in New York on November 25, 1930, former Governor Smith, now in private employment, contrasted the six months and two days required to erect the 85-story Empire State Building with the two years it took for the completion of the state's five-story office building at Worth and Centre Streets. "The answer is," he said, "the state and the city build by the letter of the law; there is no leeway; there is no freedom for an executive who has charge of public construction."

## Keeping government unencumbered

In a recent address to further the idea of an increase in first-class postal rates from 2 to 2½ cents an ounce, Assistant Postmaster-General Tilton thus apologizes for the inefficiency of his department. He states: "Perhaps I should state here that we are not free agents. To Congress is reserved the prerogative of establishing the basis for our expenses and of assigning the rates. Salaries of all workers are fixed by law. It is only by studying the possible economies in forces and facilities that we are enabled to accomplish savings in expenses. Such studies are being made, but the times are not propitious for the general application of the rules of efficiency."

It is probably the intimate knowledge of the political conditions making for extravagance and inefficiency that makes public men, who are usually so moderate in their utterances, speak in such measured terms in condemning

proposals of governments in business. Former President Coolidge stated: "If it is desirable to protect the people in their freedom and independence, if it is desirable to avoid the blighting effects of monopoly supported by the money of the taxpayer, if it is desirable to prevent the existence of a privileged class, if it is desirable to shield public officials from the influence of propaganda and the acute pressure of intrenched selfishness, if it is desirable to keep the government unencumbered and clean, with an eye single to public service, we shall leave the conduct of our private business with the individual, where it belongs, and not undertake to unload it on the government."

No less sweeping a statement was made by Herbert Hoover: "Under government ownership, partisanship, 'log-rolling' and politics would be the inseparable accompaniments of administration. No great business can be efficiently administered by such a board or such a basis of choice. We shall convert business into politics and surrender efficiency for spoils. If we distribute railway extensions as we distribute public buildings, if we locate electric power plants as we locate reclamation projects, if we divide up public industries generally as we share river and harbor improvements and army and navy stations—then, as surely as night follows the day, facilities will be wastefully provided for those districts or groups which are politically strong and they will not be adequately provided for the districts or groups that are politically weak."

There seems to be no restraint upon the taxes imposed through an extravagant and inefficient government. If I may quote from a previous address: "In 1913 the average cost of government per family was six times the average family electric bill; last year it was nearly fifteen times the average electric bill of $31. That is, for each dollar a customer spends for household electric service he has to pay nearly $15 in taxes for the cost of government. This is food for sober thought."

▼ ▼ ▼

# Stage Lighting Directed by Baton*

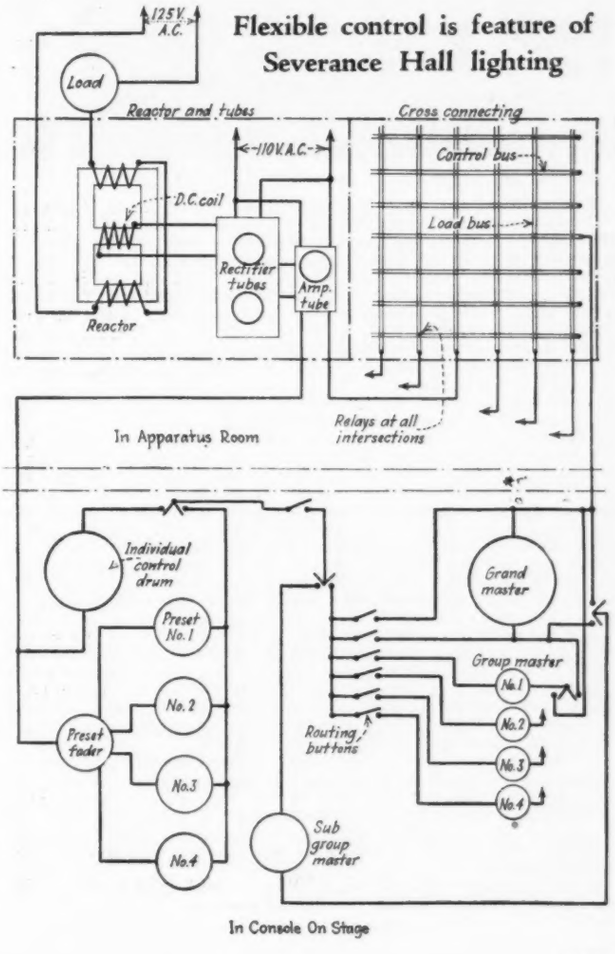
WITH a very carefully worked out scheme of lighting in Severance Hall, the new home of the Cleveland Symphony Orchestra, it was desired to make it possible for a single operator to control singly and in combination all lighting of the main auditorium and stage in a manner analogous to an organist's control of sound. The system developed to accomplish this consists of a console in the orchestra pit having hand and foot controls conveniently located as on an organ, reactance dimmers controlled by electron tubes and a relay cross-connecting panel which connects the reactors, through their control tubes, to the organ controls.

One reactor per load is provided. To make the operation of these units clear, any reactance dimmer may be taken as an example. The a.c. load current flowing in the reactor is directly dependent on the d.c. saturation current flowing in the other coil of the same unit. This d.c. supply is furnished by two neon-filled rectifier tubes, the output of which is controlled by varying their grid bias. The output control is accomplished by a small tube of conventional radio amplifier type, which in turn has its output controlled by variation of a d.c. or conventional radio "C" battery bias on its grid. The control wires to this grid come from one of the 110 vertical buses on a relay panel, the nerve center of the cross-connecting mechanism.

The relay cross-connecting panel consists of 36 horizontal rows of relays with 110 relays in each row. Each horizontal row is connected with one of the 36 dimmer-control drums on the console. Each vertical row is connected to a one-tube control unit, its associated reactor and, in turn, load. By closing any relay at the intersection of a horizontal with a vertical bus, any one of 3,960 possible connections can be made.

It was obviously impossible to run the 3,960 wires of the system to the console or to accommodate that number of switches. Therefore, 110 load switches and 36 control selectors were placed at the organ-console-type switchboard. This provides flexible control of 110 sliding circuits by 36 flexibly connected dimming controls and four additional controls which do not pass to the

**Flexible control is feature of Severance Hall lighting**




*Based on I.E.S. paper by Dean H. Holden, Walker & Weeks, Cleveland.

cross-connecting mechanism. Essential elements consist of:

Remote controls enabling the switching of any one or up to seven of the 110 load circuits to any one of the 26 individual control drums; 36 individual control drums which remotely control the resistance dimming of whatever circuits may be connected to them by the switching above mentioned; nine sub-group foot pedals, each capable of electrically controlling any or all of the corresponding sub-group of four control drums; four group masters, foot- or motor-operated, each capable of electrically controlling any combination of the 36 individual controls which it may be desirous to connect to them; one grand master, foot- or motor-operated, capable of controlling electrically any or all individual controls or group controls; one preset dimming device associated with each individual control drum, but with individual scene faders operated on a common gang shaft by motor or hand; small sliders which provide for four presets of dimming on a control unit; four individual controls and one master for handling the house direct lighting; remote individual control for twenty four-color boomerangs on spotlights; remote individual "joy stick" control for direction and focusing of nine spotlights; signals and remote iris diaphragm control to nine arc "spot" positions; telephone to ten stations, and adequate illumination for cue-sheet rack and all working faces of console, including pedal portion.

In the console are located the potentiometers which control the grid bias from the smaller amplifier tubes. Each individual control drum operates one of these resistance units. In turn, these units can be cascaded through sub-group or through group master, each of which, in turn, can be fed from the variable voltage grand master bus or from direct feed. The individual unit, too, can operate direct from feed, independent of the mastering system. Lastly, any combination of individual controls can be fed from the grand master bus without first going through the group or sub-group masters. Field control of the generator in an independent motor-generator set is obtained by a master rheostat on the console.

*Courtesy Westinghouse Electric & Manufacturing Company*

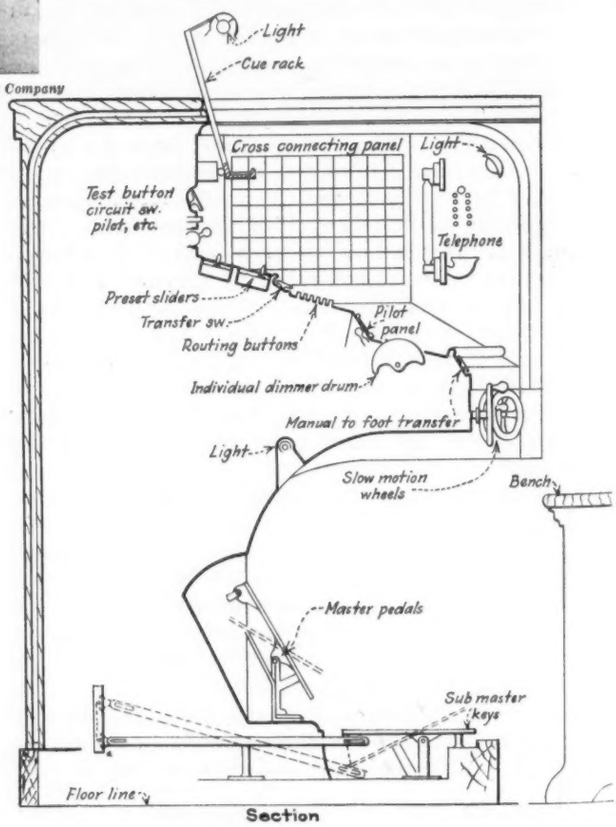
Beginning at the floor in the physical arrangement, there are inclined foot pedals comparable to the swells of an organ, one for each group master and one for the grand master. In front of these are nine broad foot keys. These operate the sub-master potentiometers. Next above, and at the edge of the operating manual position, are 36 tilt tablet switches, again of the usual organ type. Each of these is associated with one of the 36 individual control drums, and, in turn, each group of four tablets is tied to one of the foot-pedal sub-group masters. Immediately above these on a sloping ledge are 36 individual drum controls. The next tier is a row of 36 tilt tablets serving to connect a given load circuit to preset or manual control at will. Above these are 36 panels containing jack-type telephone switches. There are six buttons in each of the panels, the first connecting control circuit direct to feed, the second to grand master and the last four to any one of the group masters. On the next slope are located the preset, slider-type potentiometers. There are four of these to each of the 36 control circuits. Associated with these, but behind the panel, is the preset fader potentiometer. All of these faders are ganged on a common shaft. The last row at the top of the board has 36 tilt tablet switches to throw a given control on or off and a test button which lights pilots on load circuit switches. The tilt tablets have an additional contact which lights a pilot light.

A 4-in. panel running from top to bottom through the center face of the console contains all master controls. At the top is a clock; below, the master fader drum. The grand master drum follows. Below this are the four group master interlocks from foot to motor control. Lock and master switches and other miscellaneous items are worked into the spare space just above these. Scene pilot lights are provided which fade from scene to scene.

On the diagonal sides of the board, in the vertical faces, are the 110 cross-connecting switches and pilots, 55 on each side of the operator. On the inclined face at the left are the house light dimmers and above these are located the boomerang controls. In the right-hand inclined panel are the "joy sticks" for remote directional spot control. There also are the spot signals and diaphragm controls.

In the vertical ledge, immediately in front of the operator, are the five slow-motion wheels for master control.

## Console-type switchboard controls lights




Section

# Prospects Hopeful on Metals for 1,000-1,500 Deg.*

By H. W. SPRING
*Crane Company, Chicago, Ill.*

**Effect of temperature on tensile strength, flow and fatigue of metal. Questions value of fine granular structure. Why danger of rupture is not serious. New and more serviceable metals available for high-temperature steam at high pressure**

A FEW years ago 750 deg. F. and, certainly, 1,000 deg. F. were considered fairly safe practical maxima at which to test to determine strength of metals, these being considerably higher than the temperatures actually attained in practice. Now, however, to get as much efficiency out of each pound of coal as is possible in the central station, steam superheated to 750 and 825 deg. F. is used and 1,000 deg. F. (a dull-red heat) is contemplated. In the oil refinery field temperatures of 900 deg. F. are often used with pressures of 800 to 1,400 lb. or higher, and now experimental steels are called upon for even more serious duty. A recent inquiry for equipment named 1,500 deg. F. temperature and 2,500 lb. pressure as maxima for an experimental still.

At 1,000 deg. F. steel has only approximately one-half of its normal temperature strength. The 3,500-lb. pressure requirement now being sought means thicker walls in boilers, pipe lines and valves, anyway. This, with the addition in thickness to make up for loss in strength due to the high temperature used, promises to give valves so bulky and with flanges so thick, if built of carbon steel, that there will be difficulty in finding room for the nuts on the bolts which join them, though, of course, welding may help solve such problem. Hence a stronger steel, or at least one which loses less of its strength at higher temperature, is needed.

Most of the worries today are due to the rather drastic effect of temperature upon the materials of which the equipment has to be made. It is not that the steel or other metal is deteriorated by the higher temperature, for apparently no permanent loss in strength occurs, but it simply is not so strong while hot as while cold.

Not only does a steel with a tensile strength of 70,000 lb. per square inch at ordinary temperature give only 35,000 lb. per square inch when tested at 1,000 deg. F., but during the past ten years it further has become known that steel under continued stress and temperature has a considerably lower relation of long-time† original tensile strength at room temperature than was shown in the former short-time method of testing. Above the strain hardening or so-called equi-cohesive temperature there is no such thing as "creep limit," creep constantly going on at some rate or other, more rapidly with higher temperatures and increased stress. Large grain-sized material has greater resistance to creep than the same material with reduced grain size.

This brings up the question whether or not for service at very high temperature engineers will always want steel castings annealed completely enough to give the finest grain. Forged steel with its smaller grain and higher ductility is not as stiff as cast steel. While the temperatures are not high enough to bring it into the "flow" classification, it appears that, whether cold or at the higher temperatures, the finer grain and a grain of a metal which has been worked as in rolling or forging so that the resistance to deformation of the original grains has been broken down deform more readily; that is, at lower stresses.

### Rational view

Stretch or elongation at stresses above the elastic limit and the very slow flow which occurs at much lower stresses over a long time are far different. From short-time high-temperature tests it will be noted that at 1,000 deg. F. (540 deg. C.) the tensile strength and yield point are approximately 30,000 and 15,000 lb. per square inch, respectively. The flow-producing stress of 3,000 lb. per square inch reported on this material as giving 0.0000005 in.-per-inch-per-hour flow (1 per cent in two years) brings about an extremely slow distortion, which, so far as bringing about any early rupture of the material is concerned, is practically negligible.

To bring about rupture in a short period of time the stress would have to be increased to somewhere near the short-time yield point, where the steel under observation would start visibly to elongate, but it would require stresses near to the short-time tensile strength to bring about rupture within any comparatively short time.

**Based on paper presented before Midwest Power Conference.*

*†Joint research committee of the A.S.M.E. and A.S.T.M. on the effect of temperature upon metals.*

## *Tests Show Characteristics of Steel Under High Temperatures*

| Material | Flow Test History: Temperature, Long-Time Test, Deg. F. | Flow Test History: Temperature, Long-Time Test, Deg. C. | Flow Test History: Time Under Tests, Hours | Flow Test History: Time of Testing Loads, Hours | Flow Test History: Total Flow, In. per Inch | Subsequent Short-Time Tests: Temperature, Short-Time Test, Deg. F. | Subsequent Short-Time Tests: Temperature, Short-Time Test, Deg. C. | Subsequent Short-Time Tests: Tensile Strength, Lb. per Sq. In. | Subsequent Short-Time Tests: Yield Point, Lb. per Sq. In. | Subsequent Short-Time Tests: Proportional Limit, Lb. per Sq. In. | Subsequent Short-Time Tests: Elongation in 2 In., per Cent | Subsequent Short-Time Tests: Reduction of Area, per Cent |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.33 per cent carbon steel | 750 | 400 | 1,008 | 30,000 | 0.0400 | 70 | 20 | 82,900 | 53,800 | 51,800 | 21.0 | 34.0 |
| | **1,000** | **540** | **1,008** | **4,000** | **0.00216** | 70 | 20 | 80,450 | 43,000 | 39,000 | 27.5 | 41.5 |
| | ..... | .... | none | .... | none | 70 | 20 | 83,050 | 43,500 | 39,500 | 25.0 | 38.5 |
| 0.40 per cent carbon steel | **900** | **480** | **504** | **4,000** | **0.00045** | 70 | 20 | 82,400 | 42,000 | 41,000 | 23.5 | 36.2 |
| | .... | .... | none | .... | none | 70 | 20 | 81,100 | 37,000 | 36,000 | 24.0 | 34.7 |
| 0.40 per cent carbon steel | 550 | 290 | 456 | 12,000 | 0.00031 | 550 | 290 | 74,700 | 29,300 | 21,500 | 23.5 | 27.0 |
| | .... | .... | none | .... | none | 550 | 290 | 80,000 | 30,000 | 19,000 | 17.0 | 25.0 |
| 0.23 per cent carbon steel | **750** | **400** | **1,100** | **30,000** | **0.0160** | **750** | **400** | **67,500** | **39,400** | **29,500** | **27.5** | **42.4** |
| | .... | .... | none | .... | none | **750** | **400** | **63,000** | **29,000** | **18,000** | **29.0** | **50.0** |
| 0.33 per cent carbon steel | **750** | **400** | **1,672** | **15,000** | **0.00090** | **750** | **400** | **72,900** | **28,500** | **18,000** | **28.0** | **42.7** |
| | .... | .... | none | .... | none | **750** | **400** | **69,000** | **27,500** | **17,000** | **31.0** | **53.0** |
| 0.40 per cent carbon steel | **900** | **480** | **504** | **5,000** | **0.00047** | **900** | **480** | **54,600** | **23,700** | **14,000** | **33.5** | **55.4** |
| | .... | .... | none | .... | none | **900** | **480** | **58,000** | **25,900** | **10,000** | **32.0** | **59.0** |
| 0.33 per cent carbon steel | **1,000** | **540** | **1,008** | **3,000** | **0.00130** | **1,000** | **540** | **45,100** | **21,000** | **9,000** | **34.0** | **54.1** |
| | .... | .... | none | .... | none | **1,000** | **540** | **45,000** | **20,000** | **8,000** | **33.5** | **59.0** |

A certain amount of flow is produced even with rather low loads, and in a general way, the rate of flow is proportional to the amount of load. A rate of flow of 0.000001 in. per hour per inch of length of specimen is equivalent approximately to 0.01 in. per inch per year, or 1 per cent stretch. This can be, and we believe should be, considered largely as distortion. That is, should proper factors of safety be neglected and a tank, pipe, valve or other apparatus be subjected continuously to high enough temperature and sufficient pressure be built up to produce circumferential flow or stretch of 0.01 in. per inch per year, it would result simply in the slight expansion of the tank, pipe or valves. Unless such increase of size interferes with operation or serviceability by making the apparatus take up too much room, throwing parts of the equipment out of line, etc., it would do little or no harm, certainly no harm so far as safety to life or plant is concerned.

There is no danger of rupture for a long period of time unless for some reason flow is seriously localized through overheating at some point where it is not detected, as, for example, in a boiler or superheater tube.

Tests made by us, as well as those reported by others, show that test specimens of ductile metals at temperatures of more than 600 deg. F. (315 deg. C.) and at stresses that produce flow do not rupture until warning has been given through stretch or "flow" of 10 to 25 per cent. With this in mind, danger to life through failure by deformation from flow of such small magnitude that the total extension does not disturb serviceability over a period of years may be dismissed as practically impossible, and the whole matter of useful life can be considered mainly from the standpoint of distortion per year, or other suitable period, and whether such distortion is troublesome.

While fatigue of overstressed metal is an extremely important factor at the lower temperatures, it becomes a much less serious factor as the temperature of operation rises. Apparently, at temperatures of 750 deg. F. or over, i.e., temperatures of operation of the modern steam plant, fatigue has lost most of its importance as a factor. Naturally, metals must be used which are not eaten away, which in effect would be to reduce the metal thickness, and therefore the strength of the structure.

Boiler shells, headers, piping and, to a certain extent, valve bodies can be allowed to breathe or weave about somewhat and can be built with sufficiently thick walls to give strength. On the other hand, the interior or working parts of valves, consisting of the seating arrangements which have to fit tightly to close the valve satisfactorily, and parts of the steam turbines which use the steam, have to have particularly nice fit and adjustment maintained for the period of operation.

Boilers and tubes maintain a particularly high temperature, the tubes usually from 100 to 200 deg. higher temperature than the shell, i.e., a total of 900 to 1,200 deg. F. for 750 or 1,000 deg. F. steam. Tubes formerly have been made of carbon steel, but now that we are getting into the higher temperatures of 850 to 1,000 deg. F., they are being made of stainless steels and, more lately, 18-8 metal (18 chromium-8 nickel).

Boiler shells, headers and the piping are made of carbon steel, these carrying steam at temperatures not higher than the specified 850 to 1,000 deg. F. With the still higher pressures which are contemplated and the full 1,000 deg. F. steam, metals of better physical properties than carbon steel are being considered.

### New and more serviceable materials

Steels containing small amounts of nickel and chromium, such as the S.A.E. 3,100 and 3,200 series, the S.A.E. 6,100 chrome vanadium, the manganese alloy steels, the well-known high-chrome stainless steels and many others have been tested, but while considerably stronger at ordinary temperatures and a little stronger at elevated temperatures, they are found to suffer much the same loss in strength at high temperatures as do the ordinary carbon steels.

"Austenitic" steels, such as the 18 per cent chrome, 8 per cent nickel, with or without silicon, manganese, molybdenum, tungsten, etc.; the reverse combination with 8 to 10 per cent chromium and 17 per cent nickel; the 35 per cent nickel-20 per cent chromium steel, and a host of others, are being tested out both in a laboratory way and also in trial installations.

While "austenitic" steels show less loss of strength at the higher temperatures than do the "pearlitic" varieties, the question of chemical stability yet remains to be settled. With some "austenitics," apparently, there is a tendency to precipitate carbides upon long heating at certain temperatures, this, perhaps, tending toward brittleness. The "austenitics" have the further disadvantage of extreme toughness in working, which makes their rolling, piercing for tubes, drawing and cutting with tools extremely slow and expensive. As a class, they are workable with difficulty and this toughness promises to keep the cost of equipment made from them well up, for the present.

Closure of a valve must be perfect if steam, gas or other fluid is to be prevented from leaking through the valve. Brass, monel metal, nickel, nickel alloys, stainless steels, and some harder alloys, are used, depending upon the service desired. Some of the many characteristics necessary for a proper valve seat are:

Non-corrosiveness. Proper coefficient of expansion. Forging or casting quality. Machinability. Density and smooth texture. Proper strength and ductility. Hardness sufficient to withstand scratching. Non-galling or seizing quality. Reasonable cost.

In general, seats of cast materials seize and tear each other less than forged or rolled metals; metals of high hardness less than those of low hardness; metals of somewhat different hardness less than those of approximately equivalent hardness, and dissimilar metals probably less than seats of like metals.

### "Nitralloy"—a new seating metal

The extremely hard, case-hardened carbon steel with 700 Brinell makes a good seating metal so far as this one matter of "seizing" or tearing is concerned, but it is not non-corrosive, and a valve seat which rusts under ordinary conditions of moisture, of course, is impractical. A comparatively new seating metal, "Nitralloy," has appeared. "Nitralloy" is a forgeable steel containing small proportions of chemical elements which cause the surface of the alloy to become glass hard when heated to 900 or 1,000 deg. F. for a period of hours in a stream of dry ammonia gas. This case or coating, which usually is from ten-thousandths to thirty-thousandths inches thick, depending upon the length of "nitriding" treatment, is non-corrosive under ordinary circumstances, does not seize or tear and has the peculiar and happy advantage of becoming smoother as it wears. "Nitralloy" is giving quite satisfactory results in steam service.

In modern steam turbines which now are operated at temperatures upward of 850 deg. F. the parts must be designed to withstand severe pulsating stresses for indefinite periods of time. It is claimed that the total amount of deformation due to creep which can be tolerated in turbine parts must not exceed 0.2 per cent in twenty years. The casing or shell must be rigid in order that the moving parts inside with very small clearances may always run smoothly. The casings usually are of steel, either cast or fabricated materials. The blades are usually of monel metal, stainless iron, of 18-8 metal, etc. Like the critical parts of the valve, these must be made of non-corrosive metal.

Judging from recent progress, the possibilities of operating continuously at pressures of 2,500 lb. to 3,500 lb. and temperatures up to 1,000 deg. seem more or less limitless, considering not necessarily materials, but methods. Committees of various engineering societies are hard at work, as also are metallurgists, steel makers and engineers, and valuable results will be forthcoming.

# Block Rate Bill Estimating Can Be Simplified

By WILLIAM J. ELLENBERGER

*Formerly Commercial Department Engineer*
*Potomac Electric Power Company, Washington, D. C.*

Estimating a prospective customer's bill on a block rate is a tedious matter if the estimated consumption is broken into blocks and each multiplied by the rate for that block. A property of block rates in general may, however, be employed to simplify the computation very considerably. It amounts to assuming the lowest earned block to apply to the whole consumption and then correcting the result by the addition of the excess charge for preceding blocks.

Thus consider a typical block rate of 4.6 cents for the first 450 kw.-hr., 4.1 cents for the next 1,500 kw.-hr., 3.5 cents for the next 1,500 and 2.5 cents for the excess over 3,450 kw.-hr. The prevailing method of computing the bill for 5,000 kw.-hr. would be:

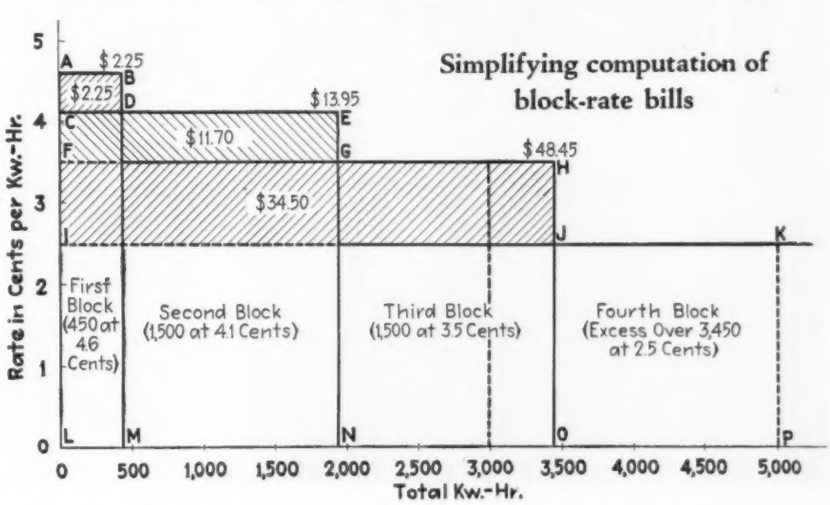
| | |
|---|---|
| 450 at $0.046 = | $20.70 |
| 1,500 at 0.041 = | 61.50 |
| 1,500 at 0.035 = | 52.50 |
| 1,550 at 0.025 = | 38.75 |
| | $173.45 |

A simpler procedure would be as follows:

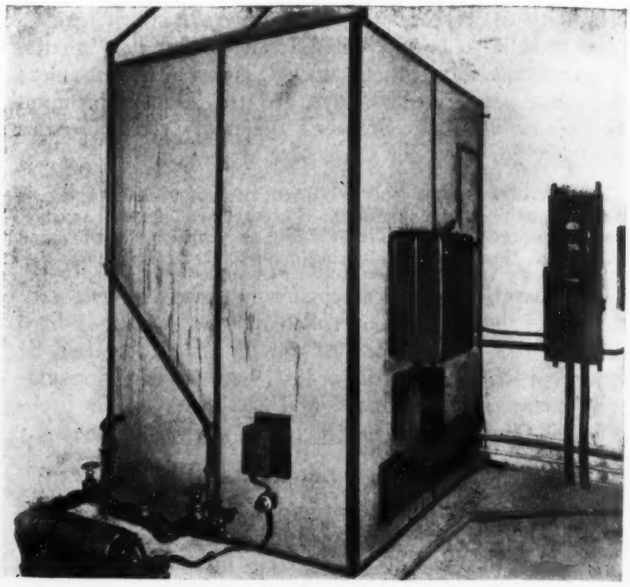
| | |
|---|---|
| 5,000 at $0.025 = | $125.00 |
| Excess for 3,450 = | 48.45 |
| | $173.45 |

The prospective customer would respond favorably to a computation made so much more quickly and consequently be less inclined to call the rate a complicated one.

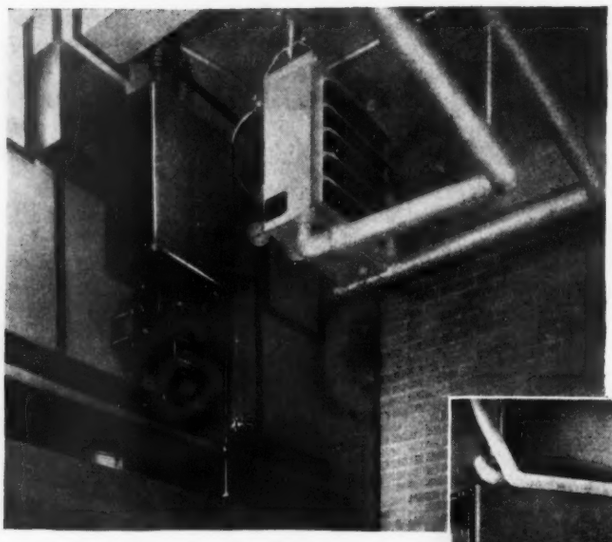
The 5,000-kw.-hr. customer owes an amount represented by the area LABDEGHJKPL. This is composed of the rectangles LIKPL (5,000 at 2.5 cents), IFGHJI (3,450 at 1.0 cent, or $34.50), FCEGF (1,950 at 0.6 cent, or $11.70) and CABDC (450 at 0.5 cent, or $2.25). The 5,000-kw.-hr. charge is therefore obtained by adding these excess rectangles to the one which stretches into the block of the lowest earned rate.



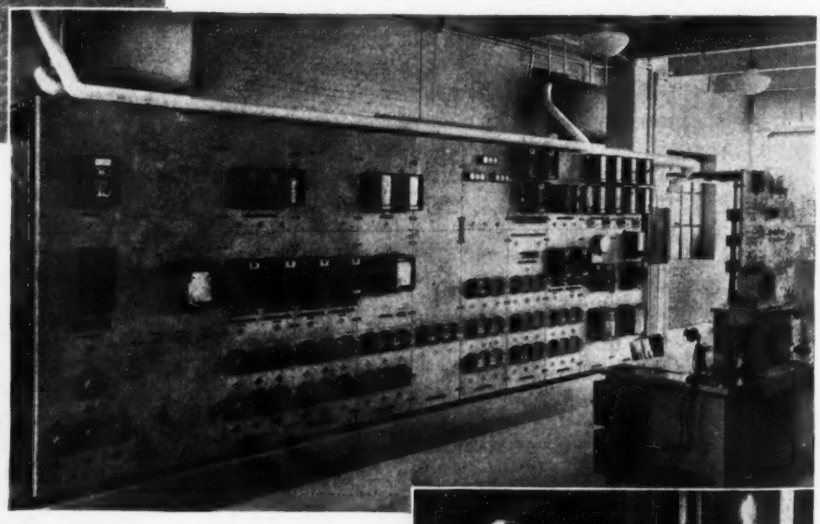
# Storage-Type Electric Heaters in Some Utility Buildings



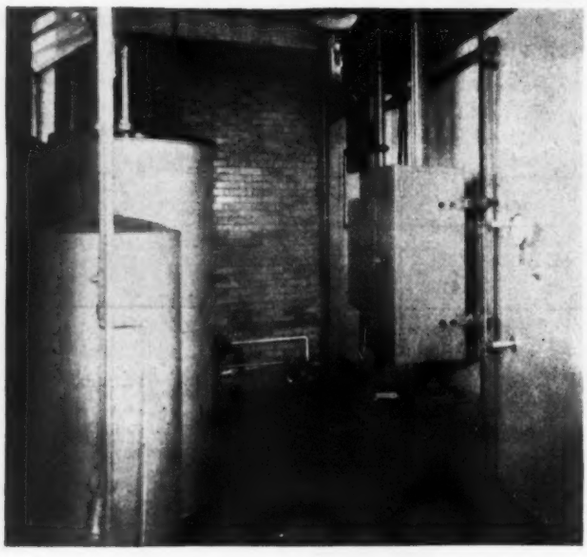
Storage-type heater in Williamstown substation. The 400-gal. tank is heated by three 10-kw. immersion units



Storage heater at Pleasant Street automatic substation, Ohio Power Company. The 800-gal. tank is heated by nine 5-kw. units.



Two radiators in Deer Creek attended substation, Indiana General Service Company. These radiators are served by a 1,600-gal. tank heated by six 10-kw. immersion heaters.



2,100-gal. storage tank in Howard substation before and after lagging. The principal supply of heat is from losses from a 15,000-kva. air-cooled outdoor condenser, the storage system being used to supplement it only in cold weather or when the condenser is not operating. The tank is heated by twelve 10-kw. immersion units.

# Electric Heat for Substation and Office Buildings

By **PHILIP SPORN**
*Electrical Engineer*
*American Gas & Electric Company, New York, N. Y.*

THE heating of substation buildings, and particularly automatic substation buildings, can obviously be best accomplished by some automatic system. Otherwise in the case of attended stations, unless two operators are used per shift, the operator may be busy attending to his heating plant at a time when he is most vitally needed at the switchboard. In the case of otherwise completely automatic stations it is patently undesirable to make the heating plant the sole reason for keeping an operator at the substation.

Where gas, natural or artificial, is available at reasonable rates, gas might of course be used, but its use at an electric distribution center is bound to present a certain incongruity. To get away from this objection a standard resistance type heater might be used. The objection to it is, of course, that at the very time when the station is delivering its peak load the heating load of the station may be superimposed on the regular load, thus robbing the station of capacity. The use of an electric heating storage system charging only during off-peak periods will in many cases eliminate both difficulties and offer an ideal solution of the heating problem.

It is interesting to note in this connection that many thousands of homes have in the past few years adopted gas heating at rates varying between 0.85 and 0.60 dollar per 1,000 cu.ft. Assuming 550 B.t.u. gas and a boiler efficiency of 75 per cent, the lower of these rates represents a cost of 4.95 mills per 3,415 B.t.u. absorbed by the water. At a distribution station, if the charging is done off-peak, it is not unfair, in cases involving use of energy for its own purposes, for an operating company to stack up this cost against the incremental cost of generating a kilowatt-hour of energy, and it is apparent that 5 mills will meet the incremental generating cost on almost any modern system.

Besides the ease of automatically controlling the charging period and the temperature of the buildings being heated, the electric system offers the further advantages of cleanliness and the elimination of combustion in a building that may not be visited for days at a time. Finally, there is the benefit (by no means negligible) accruing to an electric utility from carrying out electrically as many functions in its daily business as is economically feasible.

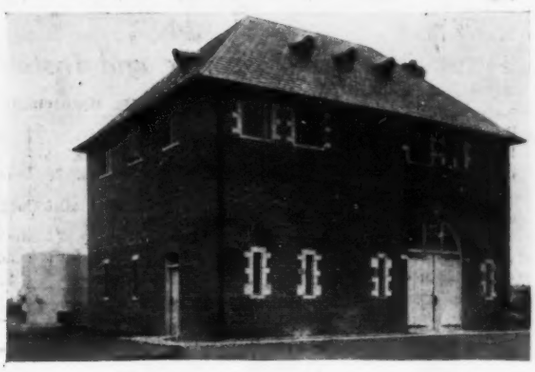
Based on these considerations, a number of substations and office buildings on the properties of various subsidiaries of the American Gas & Electric Company have been equipped with electric storage type heating systems. In the Hall system employed in all these installations water is heated by direct contact with totally inclosed immersion units. The water in the tank is heated to a temperature of approximately 280 deg. F. and a corresponding pressure of 50 lb. per square inch, and is circulated through the radiators by means of an electrically driven pump, thermostatically controlled.

The general basis on which to

**Pulaski (Va.) office building, Appalachian Electric Power Company**

**Howard attended substation, Ohio Power Company**

**Williamstown automatic substation, Atlantic City Electric Company**



make calculations for justifying or disproving the economic feasibility of electric heating is outlined above. For any specific case it is of course necessary to balance the various factors, taking into consideration not only the points outlined but also such items as the construction of the building (that is whether it is insulated properly or not), the degree of heat necessary to maintain for proper functioning of the apparatus and personnel in that building, and the intangible items, such as the value of having a given number of installations at a particular point on a system with which to obtain general experience in electric heating. The value assigned to all these various factors would logically vary in different locations, so that for a given type of substation it may be possible to justify electric heating at one point and not justify it at another point.

It is expected, at the end of the present heating season, to summarize in the ELECTRICAL WORLD the actual results obtained at the group of substations outlined above and compare the data with the predicted performance.

▼ ▼ ▼

# Electric Range Service Costs Decline

FEW power companies selling electric ranges have kept such detailed and accurate service and installation costs as has the Portland (Ore.) General Electric Company (formerly Portland Electric Power Company). Presented herewith are several tables that should prove valuable to any one who is interested in the range business.

Contrary to the policy of most utilities serving electric ranges, this company for a number of years followed the practice of servicing all ranges connected to its lines free of charge indefinitely. Most central stations on the Pacific Coast furnish both labor and material free for the first year, the material coming under the manufacturers' guarantee. After that some charge for both labor and material, while others charge for material only. In August, 1927, the Portland company began charging for material at cost plus 10 per cent. This produced a noticeable falling off in complaints per range as well as materially to reduce servicing costs.

The steadily declining unit service cost per range from 1919 to 1929, as shown in one of the tables, is due to the constant improvement in ranges over a period of years; to more efficient servicing methods, and to increasing range saturation. The low cost of $2.37 per range attained in 1929, which is less than 5 per cent of the annual revenue, is proof that servicing costs are no great detriment to building a range load.

## *Cost of Reconditioning Used Electric Ranges*

*1929*

| Number of Ranges Reconditioned | Material Cost | Labor Cost | Total |
|---|---|---|---|
| 88 | $337.92 | $670.61 | $1,008.53 |

**Average Cost per Range**

| Material | Labor | Total |
|---|---|---|
| $3.84 | $7.62 | $11.46 |

## *Comparison of Range Installation Costs*

| Year | Total Ranges Installed | Labor Cost per Range | Material Cost per Range | Cartage Cost per Range | Total Cost per Range |
|---|---|---|---|---|---|
| 1923 | 1,361 | $7.53 | $3.47 | $1.09 | $12.09 |
| 1924 | 1,788 | 5.35 | 2.03 | 0.83 | 8.22 |
| 1925 | 2,241 | 5.18 | 1.85 | 0.73 | 7.76 |
| 1926 | 2,239 | 5.07 | 2.17 | 0.76 | 8.00 |
| 1927 | 1,961 | 5.32 | 1.51 | 0.63 | 7.56 |
| 1928 | 1,093 | 6.41 | 1.86 | 0.67 | 8.94 |
| 1929 | 1,289 | 6.18 | 1.34 | 0.64 | 8.16 |

EXPLANATORY NOTE—Figures given for years prior to 1928 include all ranges connected; for 1928 and 1929 figures given apply only to new ranges delivered from company warehouse. In 1928 cost of connecting ranges from outside sources was included under service costs; in 1929 a separate cost classification for these connections was established, as shown below. A charge of $1 is made for connecting ranges other than new ranges from local dealers, and the revenue from this source, being credited to material, has balanced the amount charged under that heading.

**Connection Costs**

| | | | | | |
|---|---|---|---|---|---|
| 1929 | 1,049 | 2.57 | .... | 0.37 | 2.94 |

## *Comparison of Range Service Costs*

| Year | Ranges in Service Dec. 31 | Average Ranges in Service | Number Complaints | Complaints per Range | Labor per Range | Material Cost per Range | Cartage Cost per Range | Cost per Complaint | Total Cost per Range |
|---|---|---|---|---|---|---|---|---|---|
| 1919 | 620 | 456 | 1,153 | 2.5 | $3.96 | $1.56 | | $2.18 | $5.52 |
| 1920 | 782 | 701 | 1,506 | 2.1 | 4.54 | 3.34 | Included in Mat'l | 3.67 | 7.88 |
| 1921 | 1,082 | 846 | 2,009 | 2.3 | 5.31 | 2.53 | | 3.30 | 7.84 |
| 1922 | 1,615 | 1,348 | 3,141 | 2.3 | 3.30 | 4.08 | | 3.17 | 7.38 |
| 1923 | 3,081 | 2,348 | 6,059 | 2.5 | 2.38 | 3.59 | $0.66 | 2.57 | 6.63 |
| 1924 | 4,818 | 3,972 | 8,956 | 2.4 | 2.36 | 2.67 | 0.50 | 2.45 | 5.53 |
| 1925 | 6,707 | 5,762 | 12,166 | 2.1 | 2.11 | 1.73 | 0.47 | 2.04 | 4.31 |
| 1926 | 8,620 | 7,695 | 3,074 | 1.6 | 1.92 | 0.73 | 0.48 | 1.85 | 3.13 |
| 1927 | 10,402 | 9,511 | 14,189 | 1.5 | 1.87 | 0.47 | 0.39 | 1.83 | 2.73 |
| 1928 | 11,914 | 11,158 | 16,566 | 1.5 | 1.87 | 0.39 | 0.39 | 1.79 | 2.66 |
| 1929 | 13,825 | 12,869 | 17,385 | 1.35 | 1.69 | 0.38 | 0.30 | 1.76 | 2.37 |

## *Range Service and Installation Cost—1929*

**Range Maintenance Costs**

| Ranges in Service 1-1-29 | Ranges in Service 1-1-30 | Average in Service | Increase | Labor Cost | Material Cost | Cartage Cost | Total Cost | Total Cost per Range |
|---|---|---|---|---|---|---|---|---|
| 11,914 | 13,825 | 12,869 | 1,911 | $21,807.78 | $4,905.59 | $3,829.72 | $30,543.00 | $2.38 |

**Complaint Costs**

| Complaints Received | Complaints per Range | Labor Cost per Complaint | Material Cost per Complaint | Cartage Cost per Complaint | Total Cost per Complaint |
|---|---|---|---|---|---|
| 17,385 | 1.35 | $1.25 | $0.28 | $0.22 | $1.75 |

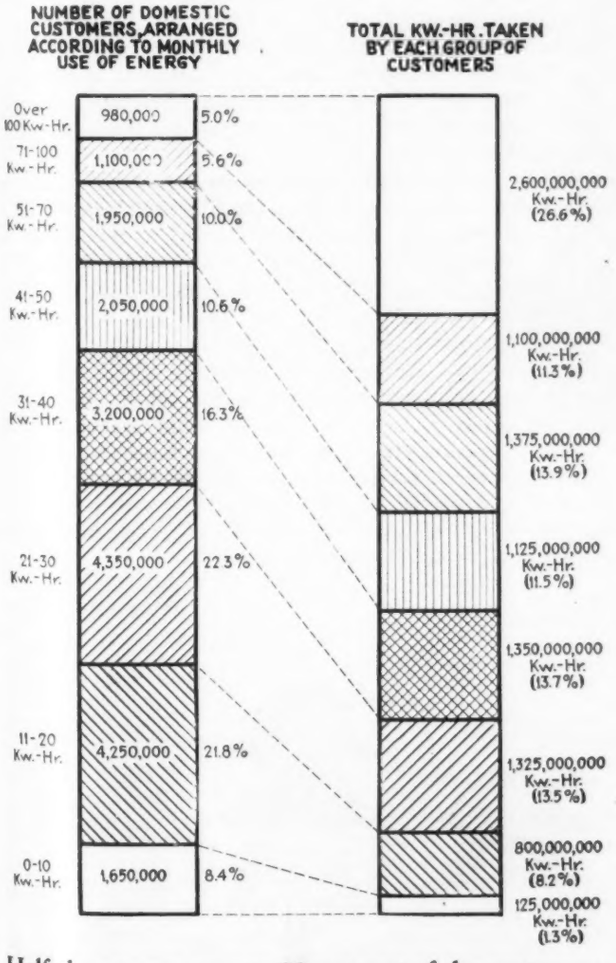
**Installation Costs**

| Ranges Installed 1929 | Labor Cost | Material Cost | Cartage Cost | Total Cost | Cost per Installation |
|---|---|---|---|---|---|
| 1,289 | $7,964.00 | $1,731.22 | $820.53 | $10,515.75 | $8.1[illegible] |

# Many Customers Use But Little Energy

Most companies know their average energy sales per domestic customer, but a classification of these sales by consumer groups is not so readily to be had. Many customers use very little energy; in fact, the number of those using less than the arithmetical average number of kilowatt-hours far exceeds 50 per cent, generally speaking. The average is brought up by the comparatively limited number of very heavy consumers.

An analysis of 1929 operations by consumer groups, taking the country as a whole, indicates that more than half of them take less than 30 kw.-hr. monthly, or 360 kw.-hr. annually, though the arithmetical average is computed at 502 kw.-hr. The half-way point is, in fact, 340 kw.-hr. The group of those who consume 20 kw.-hr. monthly, or less, constitutes more than 30 per cent of the total number, but their aggregate energy consumption is less than 10 per cent of the whole. At the other end, 5 per cent of the customers account for 26.6 per cent of the domestic energy sales.

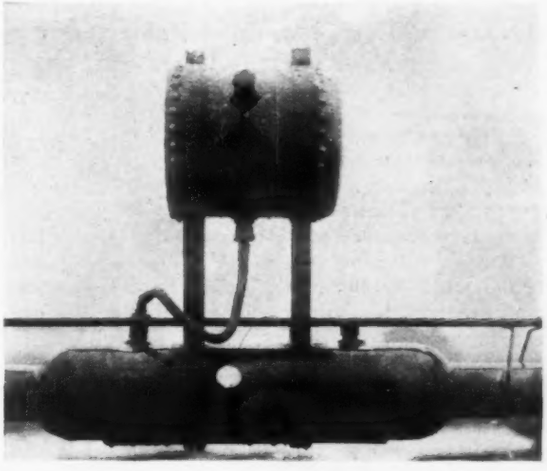



**Half the energy goes to 20 per cent of the customers; the other 80 per cent use the other half**

These relationships are brought out in a study of which the results appeared in a recent issue of the N.E.L.A. *Bulletin*. The figures are necessarily based on a process of sampling, since complete data on this point are not to be had, but it is probable that they are substantially representative for the entire industry. As more companies analyze their operations by consumer groups, the scope of such a survey can be enlarged. It is apparent that a considerable percentage of customers do not use enough energy to pay their way.

# Oil Reservoir on Cable Joint Saves Material

**By O. L. RIGGS**
*Underground Foreman*
*Lynn (Mass.) Gas & Electric Company*



Material and pole space may be saved in three-conductor type "H" aerial cable by mounting the oil reservoir on the joint itself, as shown in the accompanying figure. In this way the running of a long hose from the pole to the joint may be avoided, as may also be the buying of cable to length so that the joints will be at the poles, methods which prove inconvenient when it becomes necessary to change pole locations. This arrangement, adopted by the Lynn Gas & Electric Company, has proved both economical and satisfactory.

In the case illustrated the cable is $3\frac{1}{4}$ in. in diameter and weighs 15.9 lb. per foot. The reservoir is strapped around the joint and messenger by two $1 \times \frac{1}{4}$-in. mild steel bands bolted together on each side of the messenger and the reservoir, the weight of the reservoir being supported by the messenger. To prevent tipping, the straps are welded to a sheet-iron cradle curved to fit the joint. The filling nipples on the joint are offset to avoid the messenger. The capacity of the reservoir is 2.5 gal. and it weighs 30 lb. when full. No chafing of the joint sleeve by the cradle has occurred in two years' service.

# READERS' FORUM

## Differs Regarding Surface Leakage

*To the Editor of the* ELECTRICAL WORLD:

While agreeing with most of the statements made in S. Murray Jones' article "Designing Insulators to Combat Fog," which appeared in your issue for December 20, 1930, there is one remark that appears to me to be very much open to criticism. In dealing with the computation of "the surface leakage resistance factor" for a particular insulator it is primarily assumed therein that the whole of the exposed porcelain surface has a constant specific resistance per inch square. My experience has shown that this assumption is incorrect, especially where insulators are alive.

There is, first, a very great likelihood of deposits not adhering to the upper surfaces exposed to the natural washing effects of rainfall, whereas underneath the rainsheds deposits may form and remain undisturbed.

***Average 50-Cycle Flashover Values for Two Pin-Type Insulators***

| | Type "A" | Type "B" |
|---|---|---|
| Leakage resistance factor | 1.35 | 1.6 |
| Dry flashover value (kv.)—no deposit, 50 per cent humidity | 1.33 | 1.70 |
| Flashover value (kv.) with 0.007 grams salt deposit. Per sq.cm. surface: | | |
| 60 per cent humidity | 1.58 | 1.68 |
| 80 per cent humidity | 0.73 | 0.40 |
| 95 per cent humidity | 0.58 | 0.22* |

*The surface of the insulator conducted furiously.

Second, due to the variation in stress distribution, deposits are well known to collect more readily on certain surfaces than on others. This is well illustrated in the accompanying view (reprinted from the *Proceedings* of the International Conference on Large Electric Systems, Paris 1929) or four pin-type insulators which were exposed for a period to a thick coal-smoke fog, the left-hand unit of each of the two types having been made alive with 44 kv., while the right-hand unit remained dead. To avoid misinterpretation, it should be noted that the left-hand pair were brown glazed, while the right-hand pair were white glazed.

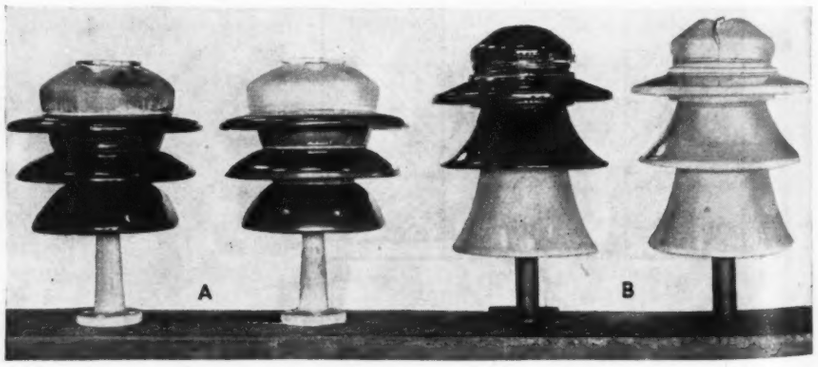
Laboratory flashover tests showed that under salt fog conditions a worse performance was given by the insulator with the better surface leakage resistance factor.

Finally, if we take an extreme case, say a straight rod of diameter "A" and length "B," having a surface leakage resistance factor $F$, this factor is doubled by halving the diameter of the rod, though the sparkover wet, dry or under-fog conditions is obviously unaffected.

From the preceding remarks it will be appreciated, therefore, that a good surface leakage resistance factor may play only a very minor part in the design of an effective insulator for foggy districts.

8 Radstock Road,
Stretford, Manchester, England.

J. K. GILLETT.




**Effect of subjecting four pin-type insulators to thick coal-smoke fog**

The left-hand unit of each group was subjected to fog while energized at 44 kv.; the right-hand units of each group were not energized. The left-hand pair were brown glazed, while the right-hand pair were white glazed

## Now—The Internal Combustion Turbine?

*To the Editor of the* ELECTRICAL WORLD:

The death of Sir Charles Parsons—which will be universally mourned, but particularly among engineers—throws into bold relief the fact that the internal combustion turbine has yet to be made a practical proposition. I suggest that no finer monument to his life and work could be raised than the solution of this fascinating problem. His triumph over enormous difficulties—metallurgical, structural, thermodynamical—should provide the stimulus, if such were needed, to attack the obstacles which still stand between experiment and achievement in this field.

The need for this prime mover is abundantly evident throughout the world today. Already the piston type of internal combustion engine is used in vast numbers for cars, boats, ships and airplanes, a challenge to the efforts of Parsons and his contemporaries. But no engineer would agree that such reciprocating machines are the last word in design.

Surely the internal combustion turbine is not given up as hopeless, when we have at our disposal means, materials and methods which were denied to the pioneers of the steam turbine. Among the accumulated data in the operation of steam turbo-generators during the past twenty years there ought to be found the key to this hitherto unsolved engineering puzzle. Boiler makers may disapprove, but engineering cannot stand still, and the internal combustion turbine would appear to be the next logical step forward from the steam turbine. To stop at the piston engine in converting the latent energy of oil into mechanical energy would be to leave unfinished the work of Parsons and his associates, and, further, would suggest the bankruptcy of inventiveness among present-day engineers.

W. E. WARRILOW,
Electrical Engineer.

Oxhey, Herts.,
England.

# Men of the Industry

### *R. M. Watt Directs Operations of Kentucky Utility*

R. M. WATT, who has been mountain district manager of the Kentucky Utilities Company at Pineville, Ky., in charge of the big power plants at Pineville and Varilla, Ky., and at Pocket, Va., and the Old Dominion Power Company properties in Virginia, has been transferred to Louisville as executive vice-president. Mr. Watt went with the Pineville operations of the company seventeen years ago, and for several years has been district manager and a company director. His new appointment places him in charge virtually of the operations of the company and its associated companies over the state.

J. H. BAILEY, formerly chief engineer, mountain district, becomes division manager for the mountain division, succeeding Mr. Watt, and will have his headquarters at Pineville. The company, an Insull organization, has divided its territory into four divisions, with one man responsible for each division. L. P. WHITE, formerly manager at Paducah, has been placed in charge of the western division, with office at Paducah. C. B. HANNA, formerly manager at Lebanon, Ky., has become manager, central district, with headquarters at Elizabethtown, Ky. J. P. POPE of Lexington, Ky., will be manager of the Blue Grass division, with headquarters at Lexington, and will continue as vice-president of a number of the companies. One new department is being added at Louisville, known as the new-business department, in charge of O. G. KUNKEL, formerly with the engineering department at Louisville.

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H. E. HOADLEY, for the past twelve years distribution superintendent of the Warren division of the Ohio Public Service Company, has been transferred to the Empire District Electric Company at Joplin as head of the engineering department to succeed S. S. Evans.

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W. H. LESSER has been appointed combustion and mechanical engineer of the newly organized Penn Anthracite Collieries Company, Scranton, Pa. Mr. Lesser has wide practical experience in the preparation, utilization and distribution of anthracite. A graduate of Lehigh University, he worked at first for the Philadelphia & Reading Coal & Iron Company and since 1917 he has worked in the operating department of Madeira, Hill & Company's anthracite mines as mechanical engineer. His work in electrical engineering is represented by the complete electrification of that company's properties. Mr. Lesser is a member of the American Society of Mechanical Engineers and manager of its local anthracite section. As a member of the American Institute of Electrical Engineers he served as chairman of the committee on applications to coal mining.

WORTH ALLEN of Greeley, hold-over member of the Colorado Public Utilities Commission, has been named as its chairman by Governor Adams, filling the vacancy caused by the expiration of Otto Bock's term. The other members are DAN S. JONES of Center (reappointed) and EDWARD E. WHEELER of Ouray, designated for a six-year term.

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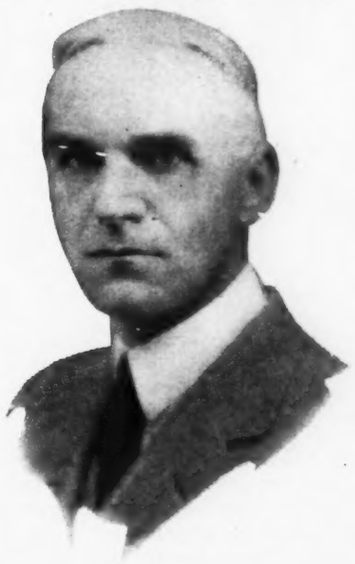
## Snyder and Gibson New Vice-Presidents of Up-State Utility

OTTO SNYDER and NORMAN R. GIBSON, who were recently elected vice-presidents of the Niagara Hudson Power Corporation, as announced in the February 14 issue of the ELECTRICAL

WORLD, have both had extensive experience in the public utility field. Mr. Snyder's utility training began with his connection with Stone & Webster, owners and operators of utility properties, shortly after his graduation from Cornell University in 1908. There followed a series of utility associations in Rhode Island, Washington and Michigan before his return to New York State in 1917. At that time he entered the employ of the Adirondack Electric Power Corporation at Glens Falls. In 1921 he was appointed general superintendent of the Adirondack Power & Light Corporation and in that capacity had charge of all engineering, construction, plant operation, transmission and power supply. In 1925 he was made general manager of the Adirondack properties. Upon the formation of New York Power & Light, in 1927, Mr. Snyder was appointed executive vice-president, and elected president in 1929.

Mr. Gibson started his public utility career in 1904 as draftsman for the Ontario Power Company of Niagara Falls, subsequently becoming structural designer for the Niagara Falls Hydraulic Power & Manufacturing Company. He then became identified with some engineering projects in Canada. His first connection with the Niagara Falls Power Company was in 1918, when he became hydraulic engineer of the Hydraulic Power Company and later the



Niagara Falls Power Company. He served successively as executive engineer, chief engineer and finally vice-president and chief engineer. Mr. Gibson was distinguished during the past year in receiving the Elliot Cresson medal for the most practical application

of engineering science to public utility needs. This award was made by the Franklin Institute of Philadelphia.

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### *G. E. Whitwell New Vice-President in Philadelphia*

GEORGE E. WHITWELL, vice-president in charge of sales and service of the Philadelphia Company and affiliated corporations of Pittsburgh, has been elected vice-president in charge of sales of the Philadelphia Electric Company. Mr. Whitwell has had extensive training in the sales branch of the public utility industry. A native of Washington, D. C., and a graduate of the Massachusetts Institute of Technology, he

worked as research engineer for the Anaconda Copper Company until the World War. After relinquishing his military duties he joined the Washington State Geological Survey and in 1920 became research investigator of the Seattle Lighting Company. He taught chemical engineering for three years at the University of Washington, jointly serving as consulting engineer for the Tacoma Gas & Fuel Company. He then became vice-president of the Young-Whitwell Gas Process Company, formed by D. J. Young, manager of the Tacoma company, and himself, the two having developed a new back-run carburetted water gas process. In 1924 he was named general superintendent and manager of new business for the Tacoma Gas Company, but in 1926 he transferred his interests to the East as general manager of the Equitable Gas Company with headquarters in Pittsburgh.

In the spring of 1927 he was appointed general sales manager of the Philadelphia Company and two years later was elected vice-president in charge of sales and service. Mr. Whitwell is a member of the National Electric Light Association, the Pennsylvania Electric Association, the Electric League of Pittsburgh and a number of other utility associations. He will assume his new duties April 1.

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D. C. PRINCE has been appointed engineer of the switchgear department of the General Electric Company at Philadelphia. The appointment includes supervision of switchgear research activities at Schenectady. Mr. Prince has had extensive experience in the employ of the General Electric organization since 1912. From the service shop in Chicago he removed to Schenectady, entering the test department. In 1914 he was transferred to the railway engineering department, but later in the year left the company to join the Illinois Commerce Commission. He was re-engaged by the General Electric Company in 1919 and since that time has served in the radio engineering department, in the research laboratory and in the switchgear department as research engineer. R. M. SPURCK continues as assistant engineer with extended duties and CHESTER LICHTENBERG, assistant engineer since 1927, has been relieved of his duties to undertake a special assignment.

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## OBITUARY

### *Lieut.-Gen. Edgar Jadwin*

LIEUT.-GEN. EDGAR JADWIN, chairman of the Interoceanic Canal Board and formerly Chief of Engineers, U. S. A., died suddenly in Balboa, Canal Zone, March 2 as the result of a stroke of apoplexy. The death of General Jadwin, who was 65 years of age, brought to a close a military career distinguished for its tremendous engineering achievements. He handled the difficult construction tasks involved in the housing, hospitalization and moving of the American army in France, and the competence with which this undertaking was handled under trying conditions won him the Companion Order of the Bath, a British decoration. France made him a Commander of the Legion of Honor and the United States government awarded the Distinguished Service Medal. When the floods of 1927 wrought havoc through the Mississippi Valley prompt measures for emergency relief were carried out along lines suggested by General Jadwin, and it was his plan for flood control which was adopted by Congress.

General Jadwin was born in Honesdale, Pa., was graduated from Lafayette College with high honors and from the United States Military Academy at West Point in 1890 at the head of his class. He steadily rose from rank to rank and when the World War broke he was a Colonel. When General W. M. Black retired, in 1926, as Chief of United States Engineers, General Jadwin, at that time Brigadier-General, was appointed to the place with the rank of Major-General, and when he retired from the position in 1929 he was raised to the rank of Lieutenant-General. Following his retirement he entered upon new activities. In 1930 he was President Hoover's first choice for the chairmanship of the new Federal Power Commission, but because of some agitation that arose in connection with his selection his name was withdrawn. He served as a member of the advisory board of the St. Lawrence Power Development Commission. As chairman of the Interoceanic Canal Board he sailed for Panama last month and was to advise Congress as to the advisability of a new canal through Nicaragua.

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SAMUEL S. ROBINSON, 63, superintendent of the St. Croix Falls hydroelectric plant of the Northern States Power Company, died February 22 at St. Croix Falls, Wis. He had been an employee of the company for more than twenty years.

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WILLIAM CROOKS, head of the William Crooks Engineering Corporation, Little Rock, Ark., and consulting engineer for the Arkansas Power & Light Company, died suddenly in Longview, Tex., February 21. He became connected with the Arkansas utility company in 1915 and was chief engineer until he resigned a few years ago to establish the company which he headed.

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DAVID LOREE, general superintendent of the Rockville-Willimantic (Conn.) Lighting Company, died February 19 at his home in Willimantic. Mr. Loree was born in Whitehouse, N. J., and was 58 years old. He was educated in the public schools and gained his first electrical experience with the Somerville Lighting Company. He joined the Rockville-Willimantic company in 1911 and after a few years became general superintendent.

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JOSEPH W. LUKE, for ten years a superintendent of construction for the Stone & Webster Engineering Corporation, died suddenly February 24 at Pittsburgh, Pa., where he was engaged in the erection of the Cathedral of Learning by that organization. Mr. Luke entered the employ of Stone & Webster in 1911. His residence was at Dorchester, Mass.

# Financial and Statistical News

FEBRUARY'S sharp rise in market values left the utility common stocks about 15 per cent over January averages and little ground has been lost thus far in March. A representative group of holding and operating company stocks now averages around nineteen times earnings.

——PRELIMINARY DATA INDICATE THAT DIVIDENDS paid by the utilities in February mark a new high record compared with an unusually small increase in totals for all corporations. Passing of dividends, almost unknown in the power and light field, has been extensive in certain other groups.

——THERE IS AN IMPRESSION WHICH SEEMS WELL FOUNDED that the bulk of these dividend payments is reinvested in public utility securities and thus becomes an ever-increasing source of new capital.

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## Recent Additions to Legal Investment Lists

A BULLETIN WHICH INCLUDES the following additions to the list of investments legal for savings banks and trust funds has been issued by the State Bank Commissioner of Connecticut:

Buffalo General Electric gen. and ref., series B 4½s, 1981.

Pacific Gas & Electric first and ref., series F 4½s, 1960.

Kansas City Power & Light first mortgage 4½s, 1961.

Joseph A. Broderick, State Superintendent of Banks of New York, has also included in his recent list this same issue of bonds of the Buffalo General Electric Company.

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## Weekly Output Holds Level

ENERGY PRODUCTION CONTINUES on a level below that of 1929 as well as 1930, according to weekly estimates by the Statistical Research Department of the National Electric Light Association.

In the week of February 28 central electric light and power plants generated 5.6 per cent less energy than in the corresponding week last year. This year it contained the holiday which last year came in the week before. The circumstance partly accounts for the relative decline.

The Atlantic seaboard shows a decrease of 2.6 per cent in electrical output below last year. The great central industrial region, outlined by Buffalo, Pittsburgh, Cincinnati, St. Louis and Milwaukee, still continues to show, as a whole, a rather marked decrease in electrical output, being 7.7 per cent below last year, while the Pacific Coast shows a decrease of 4.7 per cent.

Arranged in tabular form, the output in kilowatt-hours of the light and power companies during recent weeks is shown in the first column.

| Week Ended | 1931 | Per Cent Change 1931 from 1930 | Per Cent Change 1931 from 1929 |
|---|---|---|---|
| Jan. 3 | 1,524,253,000 | —4.9 | —1.2 |
| Jan. 10 | 1,707,233,000 | —5.5 | —0.8 |
| Jan. 17 | 1,727,072,000 | —5.4 | —0.2 |
| Jan. 24 | 1,719,345,000 | —5.9 | —0.1 |
| Jan. 31 | 1,686,749,000 | —6.3 | —1.6 |
| Feb. 7 | 1,678,974,000 | —5.9 | —2.3 |
| Feb. 14 | 1,676,452,000 | —4.7 | —1.9 |
| Feb. 21 | 1,679,534,000 | —3.6 | —1.1 |
| Feb. 28 | 1,627,566,000 | —5.6 | —3.9 |

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## Utilities Feel Tax Burden

THE TAX BURDEN of the utilities is increasing yearly, according to a statement by President George B. Cortelyou in the annual report of the Consolidated Gas Company of New York. He said:

The burden of taxation grows heavier year by year and must necessarily be borne by the customers in the rates charged for service. The taxes of 1930 represented an addition of 14.65 cents per thousand cubic feet, on the average, to the rate which would otherwise be required for gas, more than ½ cent per kilowatt-hour, on the average, for electricity and 7.29 cents per thousand pounds, on the average, for steam.

The taxes of 1930 chargeable to gas operations amounted to $4.72, to electric operations $8.56 and to steam operations $211.62 for each customer's meter in the district.

The aggregate taxes charged against these companies and necessarily included in their cost of operation during 1930 were $28,824,177, an increase of $3,314,838 over 1929, or 13 per cent, and an increase of $4,346,603 over 1928, or 17.76 per cent.

Considered in relation to net earnings the taxes of 1930 absorbed 25.51 cents of each dollar of net average.

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## United Becomes Largest Niagara Hudson Shareholder

PROPOSED acquisition of 4,070,000 shares of Niagara Hudson stock from the St. Regis Paper Company in exchange for 2,170,666 shares of its own stock would place United Corporation in the dominant position in this system. St. Regis Paper Company, controlled by the Carlisle group, at the same time would become the largest stockholder in United Corporation. Consummation of the contract, which directors of United Corporation have already approved, would solve the much-discussed problem of ultimate intercompany relations in this group.

The suggested contract would give United 5,743,250 shares of Niagara Hudson out of 26,001,930, or 22.1 per cent. Both United Corporation and Niagara Hudson are substantial stockholders in Consolidated Gas Company of New York, hence a further drawing together of the two large New York City and up-state public utility systems.

It is further expected that an exchange of stock may be arranged with Commonwealth & Southern. It is understood that American Superpower owns about 4,500,000 shares of Commonwealth & Southern and acquisition of such a block would give United Corporation nearly 20 per cent of Commonwealth & Southern outstanding stock.

It would thus appear that United Corporation is gradually assuming a more defined dominance in the Eastern Seaboard system of utilities. The proposed contract, in fact, places it in the lead in the entire Eastern group with the exception of Commonwealth & Southern. It now holds or would hold 22.1 per cent of Niagara Hudson, 26.1 per cent of United Gas Improvement, 20.8 per cent of Columbia Gas & Electric, 17.9 per cent of Public Service of New Jersey, Commonwealth & Southern 5.3 per cent and Consolidated Gas of New York, 1.7 per cent.

## Utility Stock Values Up Nearly Billion This Year

PUBLIC UTILITY common stocks listed on the New York Stock Exchange showed an appreciation of more than $880,000,000 during February, after having made a gain of more than $425,000,000 in January. This is the largest gain made by any one group. Power and light stocks alone showed an appreciation of almost $820,000,000 in February.

Reasons given by the various market authorities for so rapid a rise in values include an oversold market condition and signs of business improvement. Of course the power and light industry fared relatively well through the trough of the depression and its earnings were probably less affected than those of any other major group. But this factor alone would be insufficient to explain all of the rise. The presence of a large short interest in the market late in the month added to market buoyancy as prices moved upward.

Generally speaking, the stocks as a group moved up in relatively the same proportion, approximately 50 per cent from the low to the high. Some of the highs and lows for the year to February 28 follow (fractions omitted):

| | High | Low |
|---|---|---|
| American & Foreign Power.... | 51 | 26 |
| Electric Bond & Share ..... | 61 | 40 |
| North American Company .... | 90 | 62 |
| Standard Gas & Electric..... | 87 | 58 |
| Commonwealth & Southern.... | 12 | 8 |
| American Water Works ..... | 80 | 53 |

A representative group of 37 power and light company common stocks showed a gain of ten points to 75 during the month of February. Holding company stocks contributed to the rise to a slightly larger degree than operating company stocks.

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## N. E. Power Decentralizes Treasury Activities

CARL S. HERRMANN, treasurer of the New England Power Association, Boston, has announced the appointment of five representatives to be responsible for groups of retail companies in coordinating their treasury activities with those of the headquarters office of this holding organization. These groups were established January 1, under territorial managers, whose names were listed in the ELECTRICAL WORLD January 31, page 248.

The new treasury representatives will make their headquarters at the group office centers at Providence, R. I.; Worcester, Arlington, Northampton and Quincy, Mass., and will comprise the following men: Earl C. Hart, Andrew P. Nichols, Elmer H. Lother, Paul Newell and Martin A. O'Malley. Each will serve as assistant treasurer of the companies in his group, and will be responsible for all treasury, accounting and related activities of the retail properties.

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## N.E.L.A. Committee Studying Accounting

WITH THE POSSIBILITY of revisions in the uniform system of accounts adopted by the National Association of Railroad and Utilities Commissioners, certain of the utilities are studying accounting methods under a National Electric Light Association committee.

While any such possible revisions would have to be initiated by the regulatory authorities, and no such move has been made, it is understood some changes are desirable to bring accounting into harmony with recent developments in the utility industry. This is largely in the direction of clarifications and refinements in connection with certain accounts which are said to be subject to different interpretations.

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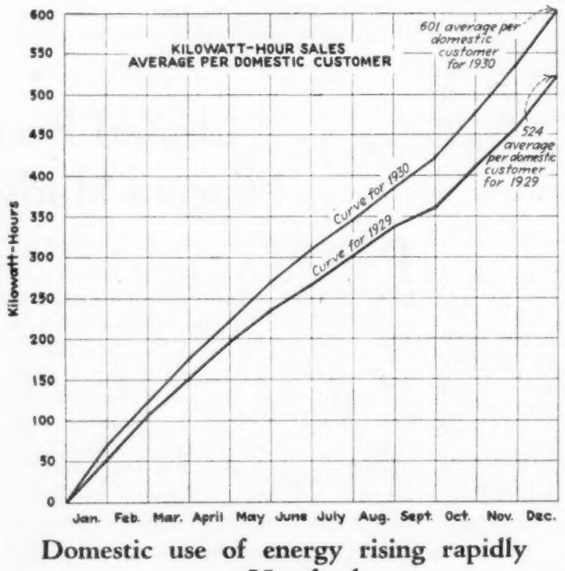
# Hartford Electric Light Company Gained in 1930

A GRATIFYING increase in the net earnings of the Hartford Electric Light Company took place in 1930 despite the adverse influence of the business depression upon industrial power sales. Gross sales of energy totaled $7,563,000, a gain of $83,000 over 1929, and the net rose from $2,344,800 in 1929 to $2,677,200 after setting aside $641,000 as an addition to retirement reserve and paying a "customer dividend" of $227,000. To tell how all this was achieved would be a long story, but among the major factors may be mentioned an increase in use from 524 kw.-hr. to 601 kw.-hr. per residential customer during the year recently closed; the production of 121,000,000 kw.-hr. by the mercury-vapor process at the remarkable efficiency of 0.72 lb. of coal per kilowatt-hour; the operation of a new 40,000-kw. steam turbine unit at South Meadow station, with corresponding new boiler equipment, and various savings obtained through the company's connection with the Connecticut Valley Power Exchange.




**Domestic use of energy rising rapidly at Hartford**

At the recent annual meeting President Samuel Ferguson declared that eleven months' operation of the mercury unit has shown very satisfactory reliability, ease and flexibility of handling. The company is now reaping the reward of its pioneering in this field and its entire plant is in condition to assure economical operation "sufficient to safeguard satisfactory earnings even if the return to normal business conditions should be delayed beyond what may reasonably be expected." The company's excellent earnings last year justified the management, Mr. Ferguson pointed out, in a reduction in household rates commensurate with the increased volume of home usage. The rate revision, effective November 1, reduced the price for energy used in excess of a small initial block from 4 cents to 3 cents per kilowatt-hour. This change immediately lowered the bills in over 45,000 homes and so cut the cost of electric service as to make it available for an increased variety of applications, making possible an average use of 20 per cent more energy without increased expense. The total assets on January 1, 1931, were $30,326,200, compared with $29,753,500 the year before and $26,103,100 at the end of 1928.

## *Annual Reports Just Issued Covering Operations in 1930*

| Name of Company | Gross Earnings 1930 | Gross Earnings 1929 | Per Cent Increase | Net Earnings 1930 | Net Earnings 1929 | Per Cent Increase | Output (Kw.-Hr.) 1930 | Output (Kw.-Hr.) 1929 | Customers 1930 | Customers 1929 |
|---|---|---|---|---|---|---|---|---|---|---|
| Central Illinois Public Service | $15,645,177 | $15,218,444 | 2.8 | $6,456,953 | $6,314,054 | 2.2 | 388,348,452 | 380,570,289 | 189,251 | 186,251 |
| Cleveland Electric Illuminating | 26,481,759 | 27,324,618 | —3.1 | 13,095,285 | 13,431,450 | —2.5 | 1,418,142,328 | 1,418,851,399 | 307,080 | 309,630 |
| Columbia Gas & Electric & subs. | 96,129,808 | 100,328,875 | —4.2 | 40,500,038 | 45,474,315 | —11.0 | 1,033,662,931 | 1,060,966,452 | 1,359,935 | 1,335,359 |
| Commonwealth Edison | 84,004,438 | 83,486,745 | 0.6 | 32,647,724* | 31,805,691* | 2.6 | 4,191,296,000 | 4,276,181,000 | 936,300 | 950,800 |
| Detroit Edison | 53,706,926 | 56,558,279 | —5.0 | 17,140,979* | 18,978,304* | —9.7 | 2,384,528,500 | 2,654,901,300 | 570,131 | 583,993 |
| Engineers Public Service and constituent companies | 53,041,640 | 50,810,589 | 4.4 | 22,732,323‡ | 21,252,244‡ | 7.0 | 2,082,926,625 | 1,915,112,168 | 411,815 | 401,274 |
| Hartford Electric Light | 7,563,000 | 7,480,000 | 1.2 | 2,677,000† | 2,345,000† | 14.2 | 321,000,000 | 345,000,000 | ..... | ..... |
| Illinois Northern Utilities | 3,947,957 | 3,836,876 | 2.9 | 1,757,355* | 1,626,971* | 8.0 | 77,212,367 | 80,829,297 | 60,244 | 58,867 |
| Public Service of Northern Illinois | 35,405,094 | 33,329,811 | 6.2 | 13,647,044* | 12,965,337* | 5.3 | 1,195,446,343 | 1,056,558,905 | 448,736 | 437,928 |
| Public Service of New Jersey & subs. | 138,161,947 | 137,086,707 | 0.8 | 43,401,344‡ | 41,830,768‡ | 3.8 | 1,701,815,456 | 1,646,998,938 | 1,735,593 | 1,646,924 |

*Operating expenses include retirement expense. †After retirement reserve and customer dividend. ‡ Operating expenses include depreciation.

# NEWS BRIEFS

New York Stock Exchange has authorized the listing of 567,422 additional shares (par $25) common stock of the Pacific Gas & Electric Company on official notice of issuance and payment in full.

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After May 1 the Engineers Public Service Company has announced it will itself direct the operation of its subsidiaries, which have been supervised under contract by Stone & Webster.

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American Gas & Electric Company has filed a certificate in the office of the Secretary of State increasing its capital from 4,600,000 shares, no par value, to 8,600,000 shares, no par value.

•

The Associated Gas & Electric Company announced that all indebtedness of itself and its subsidiaries to the Empire Power Corporation and affiliated interests had been paid and that all matters between the groups had been settled satisfactorily.

•

The entire offering of 15,000 shares of $6 no par value cumulative preferred stock of the Washington Water Power Company, placed on sale January 15 and offered to residents of Washington, Idaho and Oregon, was sold out in 21 days, according to the announcement of W. H. Ude, director of public relations.

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Stockholders of the Public Service Company of Northern Illinois recently approved an increase in the authorized common stock of 200,000 shares of no par value.

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First and refunding mortgage 4½ per cent gold bonds of the Portland General Electric Company, series due September 1, 1960, have been authorized for listing by the New York Stock Exchange to the amount of $40,000,000.

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# New Utility Financing Light

PUBLIC offering of new securities of the electric light and power companies of the country declined sharply in February to a total of $27,500,000, as compared with $300,744,000 in the month of January. Only four companies participated in the month's activities and all the issues were in the form of first mortgage bonds. The total was the smallest recorded since last August. Rights were issued to the amount of $24,171,278, which brought the total sum actually raised to $50,466,278.

It is interesting to note that two Canadian utility companies entered the market—the Maclaren-Quebec Power Company and the West Kootenay Power & Light Company, Ltd. The Quebec company's issue of first mortgage bonds involved a total of $12,000,000 and the West Kootenay offering of first mortgage bonds a total of $6,500,000.

# Utility Companies' Reports Show Effects of Depression

WHILE THE UTILITY companies have made a favorable showing in comparison with the industrial companies during the present business depression, annual reports covering 1930 activities nevertheless reflect revenue increases materially less than those enjoyed in former years.

The great reduction in industrial activity was bound to have its effects on the public utility companies as well as on other enterprises. Detroit Edison Company for the first time in its history showed gross earnings less than the preceding year. There were many separate uses of the company's service which increased, but lessened use of electric power in the large factories resulted in a falling off in earnings.

The material reduction in the sale of power to industries which occurred on account of recession of industrial activity has been offset by increased sales in other lines, especially in the domestic field. In the case of the Engineers Public Service Company the greatest increases in earnings for the year were shown in the residential business, where electricity sold increased 23 per cent, while the industrial power business declined slightly.

In spite of unfavorable business conditions, which seriously affected the entire territory service, the combined operating revenue of subsidiary companies of the Public Service Corporation of New Jersey showed an increase and the Public Service Company of Northern Illinois reported a most successful year.

## *New Security Issues of Electric Service Companies in February*

| Name of Company | Amount of Issue (Par Value) | Period (Years) | Class | Purpose | Interest Rate | Price | Per Cent Yield |
|---|---|---|---|---|---|---|---|
| Louisville Gas & Electric Co. | $6,000,000 | 30 | First and refunding mortgage gold bonds, series C | To redeem bonds, to reimburse in part for extensions and additions and for other corporate purposes | 4½ | 97 | 4.68 |
| Central Illinois Electric & Gas Co. | 15,000,000 | 20 | First and refunding mortgold bonds | To acquire various properties, to retire indebtedness and for other corporate purposes | 5 | 94½ | 5.45 |
| Louisiana Power & Light Co. | 3,000,000 | 26 | First mortgage gold bonds | To provide funds to reimburse for expenditures made for additions to property and for other corporate purposes | 5 | 98 | 5.14 |
| Pennsylvania Water & Power Co. | 3,500,000 | .. | First refunding mortgage gold bonds, series B | To reimburse in part for expenditures made in extensions to plant, property and equipment, other property acquisitions and the retirement of certain of the underlying bonds | 4½ | 96 | 4.72 |
| Total | $27,500,000 | | | Rights | $24,171,278 | | |
| Total amount actually realized | 26,295,000 | | | Total financing for February | $50,466,278 | | |

# Business News and Markets

## Westinghouse Sets Up New Merchandising Plan

Details of the merchandising department changes incorporated by Westinghouse Electric & Manufacturing Company, referred to last week, have since been announced in detail.

According to Vice-President C. E. Allen, the merchandising department is now separated into two main divisions, one under M. C. Morrow, sales manager; the other under F. R. Kohnstamm, director of merchandise. The sales manager is responsible for the entire sales organization and sales policies of the department. The director of merchandise is responsible for the development of the product, the service and the preparation of the advertising materials to go with the product.

In the division under Mr. Morrow the following appointments have been made: C. D. Taylor, refrigeration; C. H. Collins, radio; R. L. DuVal, large appliances; R. E. Imhoff, small appliances; R. B. Austrian, retail distribution; R. C. Cosgrove, rural distribution, and Marshall Adams, sales promotion manager. District merchandising managers will be as follows: Northeastern, G. T. Dunklin; middle Atlantic, W. Bandorf; southeastern, W. L. Southwell; central, P. Y. Danley; northwestern, J. J. Stanton; southwestern, C. A. Meier, and Pacific Coast, George Bailey.

In Mr. Kohnstamm's division the following assistant directors of merchandise have been appointed: Reese Mills, ranges, appliances, water heaters and farm lighting; J. F. O'Donnell, refrigerators, fans and vacuum cleaners. L. W. Staunton has been appointed advertising manager of the merchandise department, reporting to Mr. Kohnstamm.

Mr. Allen also announces the appointment of M. C. Rypinski, formerly manager of the radio department, as assistant to the commercial vice-president.

Headquarters of the merchandising department will be in Mansfield, Ohio.

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## Merchandising Unit Sells Appliances Only

A PLAN TO TEST the practicability of retail specialization of electrical appliance merchandising is being put into effect by the George Belsey Company, Ltd., distributor of General Electric refrigerators in southern California, through the addition of the full line of General Electric appliances, including ranges, table appliances, radios, washing machines and vacuum cleaners. At the present time these appliances are being distributed by wholesalers through various kinds of dealers, largely the light and power companies.

Until the introduction of radio and refrigeration, it had not been practicable or profitable to operate a store dealing solely in electrical appliances. The step to be taken by the Belsey company foretells a new distribution outlet which will specialize only in electrical appliances instead of the full electric line, which includes supplies, wire, conduit, poles, hardware, and similar equipment. In other words, such dealers will be merchandising specialists.

## Three-Year Brush Guarantee

ANNOUNCEMENT HAS JUST been made by the Columbia Electric Manufacturing Company of Cleveland that it will guarantee the brushes on its new type generators to last three years. This is stated to be a radical departure from the custom of both brush and generator manufacturers to refrain from guaranteeing brushes for any length of time.

The company states that a good quality brush and the sparkless commutation of the Columbia electroplating generator at all loads make this guarantee possible. The brushes are adjusted before the generator leaves the factory and locked in that position.

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# Soviet Bought $150,000,000 Worth of American Goods Last Year

AMERICAN products worth more than $150,000,000 were purchased by Soviet Russia during the year ended September 30 last, according to P. A. Bogdonoff, chairman of Amtorg Corporation, discussing Russian commercial relations with the United States before the Chicago City Club recently. The largest items were agricultural equipment and machine tools. Illinois and Michigan received the major portion of the business, $38,000,000 going to Illinois and $72,000,000 to the Great Lakes district.

Soviet purchases from this country can be increased steadily provided conditions do not arise to impair relations between the countries, Mr. Bogdonoff said. Allegations of political activities of the Soviet, the speaker said, have made it hard for it to buy as many United States products as it might otherwise have done because of impaired credit. Federal investigation, he added, proved none of these charges.

The five-year program, it was stated, is progressing more rapidly than formerly and there is a drastic need for machinery. Industrial production has increased 100 per cent over 1913; wages have increased 3½ times.

About $30,000,000 worth of goods originating in Soviet Russia are sold in the United States out of total exports of $500,000,000. While there were 1,500,000 unemployed in Russia early in 1930, there is now no unemployment, but rather a shortage of labor. As a consequence, labor must be shifted according to need, which accounts for rumors of labor conscription. No convict or forced labor is used, it was stated.

International commerce, the speaker pointed out, depends on balancing exports and imports. If the United States does not buy Soviet products, he argued, Russia cannot establish credit to buy United States goods. "I cannot understand how $30,000,000 worth of exports and $150,000,000 imports can be a menace to the United States."

### Sell what America needs

The U.S.S.R. is interested in selling to the United States particularly those products which are needed here, such as manganese ore, wood pulp, furs and fish products. The Soviet authorities, the speaker said, are glad to enter into agreements, putting limitations on exports that compete with products produced elsewhere.

Under normal financing conditions, and without trade embargoes, or malicious rumors, the Soviet representative said, the United States can expect much more trade with Russia. The Soviet, however, not having diplomatic relations with the United States, cannot give the banks the guarantees they require on payments. Furthermore the Federal Reserve system cannot rediscount Soviet trade acceptances. Manufacturers must therefore extend credits

individually. It was suggested that they might well organize a joint financing corporation to handle Russian business until diplomatic relations are established. The market for electric equipment and appliances in Russia will be discussed later.

## Sell 1,000,000 Refrigerators

THE CO-OPERATIVE EFFORT to sell 1,000,000 electric refrigerators in 1931 as the first step in a three-year plan is the subject of a comprehensive booklet-announcement called the Plan Book. The movement is promoted by the Electric Refrigeration Bureau, sponsored by the N.E.L.A. The functions of the bureau are stated as follows:

1. To harmonize as fully as possible the various interests involved in selling electric refrigeration.

2. To synchronize sales effort during several definite and favorable selling seasons and to back this endeavor with advertising concentrated at those periods.

3. To carry on a continuous magazine advertising campaign with the purpose of increasing the public desire for electric refrigeration and to stimulate sales everywhere.

4. To undertake and finance through each local organization a program of joint local tie-up advertising employing advertising materials provided from Electric Refrigeration Bureau headquarters.

5. To make available sales promotional materials of a tie-in nature which may be employed by any electric refrigerator manufacturer, distributor and dealer or by a central station.

## New York Metal Prices

| | Feb. 25, 1931 Cents per Pound | March 4, 1931 Cents per Pound |
|---|---|---|
| Copper, electrolytic | 10½ | 10½ |
| Lead, Am. S. & R. price | 4.60 | 4.60 |
| Antimony | 7.10 | 7 |
| Nickel, ingot | 35 | 35 |
| Zinc, spots | 4.30 | 4.40 |
| Tin, straits | 27½ | 26.75 |
| Aluminum, 99 per cent. | 23.30 | 23.30 |

## TRADE BRIEFS

Colonial Electric Company of Philadelphia will distribute Standard Electric Stove Company ranges in its trade territory.

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In the determination to build up facilities for a complete wire and cable service, the Anaconda Wire & Cable Company announces that it has acquired the Cable Accessories Corporation of Pittsburgh, Pa., with its complete line of potheads, junction boxes, joint boxes, insulating compounds and other cable accessories. These products will be manufactured hereafter at Hastings-on-Hudson, N. Y.

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Apex Electrical Manufacturing Company, Cleveland, Ohio, has acquired the Wayne Home Equipment Company, Fort Wayne, Ind.

## EXPORTS OF ELECTRICAL EQUIPMENT (PRELIMINARY)

| Article | December 1929 | December 1930 |
|---|---|---|
| Generators: | | |
| Direct current— | | |
| Under 500 kw | $90,136 | $39,390 |
| 500 kw. and over | 263,151 | 15,680 |
| Alternating current— | | |
| Under 2,000 kva. | 19,598 | 11,617 |
| 2,000 kva. and over | 20,101 | 128,817 |
| Steam turbine generator sets | 54,508 | 566,283 |
| Accessories and parts for generators | 58,133 | 37,354 |
| Arc welding sets | ..... | 36,088 |
| Self-contained lighting outfits | 79,360 | 33,081 |
| Batteries: | | |
| Storage batteries | 274,693 | ..... |
| 6-volt storage batteries | ..... | 125,957 |
| Other storage batteries | ..... | 198,293 |
| No. 6 dry cell batteries | ..... | 60,252 |
| Flashlight batteries | 340,938 | 354,969 |
| Radio B and C batteries (dry) | 48,890 | 49,454 |
| Other dry and wet cell primary batteries | 136,418 | 10,684 |
| Transforming or converting apparatus: | | |
| Power transformers, 500 kva. and over | 191,930 | 90,286 |
| Distribution transformers, less than 500 kva. | 109,713 | 95,976 |
| Instrument transformers | 5,992 | 29,281 |
| Other transformers | 209,883 | 54,901 |
| Complete battery chargers under 15 amp | 9,252 | 5,310 |
| Rectifiers, double current and motor generators, dynamotors, synchronous and other converters | 179,989 | 77,235 |
| Transmission and distribution apparatus: | | |
| Switchboard panels, except telephone | 85,002 | 90,668 |
| Switches and circuit breakers over 10 amp. | 254,782 | 82,487 |
| Fuses | 45,392 | 25,044 |
| Watt-hour and other measuring meters | 83,259 | 56,770 |
| Electrical indicating instruments | 52,817 | 44,448 |
| Electrical recording instruments | 18,824 | 39,551 |
| Other electrical testing apparatus | 85,883 | 71,967 |
| Lightning arresters, choke coils, reactors, and other protective devices | 75,357 | 45,902 |
| Motors, starters and controllers: | | |
| Motors, ¼ hp. and under | 204,164 | 151,354 |
| Motors, over ¼ and under 1 hp | 49,631 | 36,894 |
| Stationary motors— | | |
| 1 to 200 hp | $457,310 | $147,111 |
| Over 200 hp | 49,278 | 47,903 |
| Railway motors | 15,196 | 9,900 |
| Electric locomotives— | | |
| Railway | 166,121 | 448,506 |
| Mining and industrial | 13,405 | 130,368 |
| Station and warehouse electric motor trucks | 15,860 | 175 |
| Starting and controlling equipment— | | |
| For industrial motors | 209,242 | 101,069 |
| For electric railway and vehicle motors | 42,625 | 2,115 |
| Portable electric tools | 101,163 | 98,699 |
| Accessories and parts for motors | 323,026 | 118,490 |
| Refrigeration sets up to ¼ ton capacity | 497,398 | ..... |
| Refrigeration sets over ¼ to 1 ton capacity | 66,570 | ..... |
| Electric household refrigerators | ..... | 392,821 |
| Electric commercial refrigerators up to 1 ton | ..... | 106,671 |
| Thermodynamic refrigerators | ..... | ..... |
| Electric appliances: | | |
| Electric fans | 116,030 | 92,916 |
| Electromechanical health exercisers | ..... | 5,935 |
| Electric incandescent lamp bulbs— | | |
| Metal filament | 91,308 | ..... |
| For automobiles, flashlights and Christmas trees | ..... | 12,636 |
| Other metal filament bulbs | ..... | 76,024 |
| Other electric lamp bulbs | 37,925 | 8,107 |
| Flashlight cases | 158,140 | 82,804 |
| Searchlights and floodlights | 27,285 | 25,416 |
| Motor-driven household devices— | | |
| Electric household washing machines | 107,605 | 106,060 |
| Electric vacuum cleaners | 105,369 | 124,021 |
| Other motor-driven devices, except tools | 92,598 | 50,537 |
| Electric flatirons | 28,853 | 27,973 |
| Electric cooking ranges | 18,300 | 95,711 |
| Other domestic heating and cooking devices | 75,054 | 104,330 |
| Industrial electric furnaces and ovens | 20,746 | 27,097 |
| Therapeutic and x-ray apparatus | 148,661 | 104,233 |
| Signal and communication devices: | | |
| Radio apparatus— | | |
| Transmitting tubes, sets and parts | 187,341 | 120,105 |
| Receiving sets | $726,731 | $1,405,507 |
| Radio receiving tubes | 281,992 | 225,617 |
| Receiving-set components | 291,316 | 534,078 |
| Loudspeakers | 164,124 | 108,662 |
| Other receiving-set accessories | 194,316 | 922,344 |
| Telegraph apparatus | 55,344 | 24,129 |
| Telephone apparatus— | | |
| Telephone instruments | 67,891 | 30,508 |
| Telephone switchboards | 251,789 | 3,863 |
| Other telephone equipment | 572,924 | 223,838 |
| Bells, buzzers, annunciators, and alarms | 35,605 | 26,779 |
| Other electric apparatus: | | |
| Spark plugs | 143,300 | 108,733 |
| Other starting, lighting, and ignition equipment | 93,035 | 71,673 |
| Insulating material | 133,441 | 69,153 |
| Metal conduit, outlet, and switch boxes | 200,316 | 100,773 |
| Sockets, outlets, fuse blocks, and lighting switches | 181,081 | 118,476 |
| Electric interior lighting fixtures | 208,256 | 154,667 |
| Electric street lighting fixtures | 63,968 | 35,861 |
| Other wiring supplies and line material | 123,004 | 106,575 |
| Other electrical apparatus, n.e.s. | 1,188,804 | 648,085 |
| Rubber and friction tape | 56,074 | 23,047 |
| Globes and shades for lighting fixtures | 62,429 | 40,671 |
| Glass electric insulators | 14,427 | 6,222 |
| Electrical porcelain: | | |
| For less than 6,600 volts | 47,297 | 29,347 |
| For 6,600 volts and over | 85,924 | 77,818 |
| Carbons and electrodes: | | |
| Electrodes for electric furnaces | 148,242 | 110,655 |
| Other carbon products | 71,897 | 43,800 |
| Insulated iron or steel wire and cable | 26,439 | 20,836 |
| Copper, bare wire | 218,681 | 110,595 |
| Insulated copper wire and cable | 490,367 | ..... |
| Rubber covered wire | ..... | 98,254 |
| Weatherproof wire | ..... | 16,074 |
| Telephone cable | ..... | 9,011 |
| Other insulated copper wire | ..... | 310,602 |
| Totals | $12,419,199 | $11,141,979 |
| Twelve months ended December 31 | $149,335,894 | $131,977,703 |

# Market Conditions

REVIVING activity in electrical equipment and appliances continues in the Eastern district both in the central station and industrial fields. Marine business has also speeded up to some extent. Volume of business on the Pacific Coast is showing a steady growth, although there is no spectacular rise as yet.

——NEW ORDERS IN THE Middle West and Southwest districts show a slight increase, but it is not so marked as in the Eastern and Pacific districts.

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## EASTERN

—THE AWAKENING OF INTEREST *in electrical equipment is continuing in the New York market, and while commitments are appreciably below normal for the first week in March, the trend is certainly in the right direction. Central-station demand has a stronger tone than for some time past; industrial account is developing better proportions, and the outlook grows more favorable.*

—MARINE BUSINESS RECORDS *additional contracts and the expanding activity in this field is worthy of attention. Municipal demand is showing some worthwhile vigor and manufacturers are looking to that quarter for some immediate commitments for prime movers and accessory equipment. Lighting equipment appears more encouraging for spring account.*

Moore Steam Turbine Corporation is the low bidder for a turbo-alternator for the Navy Department at the New York navy yard, quoting $30,000 for the unit. There were five other bidders for the machine, the highest figure being $37,150 from a New York manufacturer. Allis-Chalmers Company will furnish a 4,000-kw. steam turbo-generator unit and accessory apparatus for a paper mill expansion program in Minnesota. A New York maker has secured an order for transformers and auxiliaries for a metropolitan central station, totaling $375,000. A municipality in Louisiana has placed a contract with the General Electric Company for switchboards for a city-owned station, the order for a generator and exciter unit going to the Busch-Sulzer Brothers Diesel Engine Company. Another Southern municipality has contracted with Fairbanks, Morse & Company for prime mover and auxiliary equipment, aggregating $225,000, for a city-owned electric light and power station.

In the marine field the Newport News Shipbuilding & Dry Dock Company has secured a contract from the Eastern Steamship Lines, Inc., for the construction of two twin-screw steamers for coast service, oil-burning type, each 403 ft. long, with 61-ft. beam; propulsion will be furnished by two sets of single-reduction geared turbines, with underslung condensers. The award totals $7,000,000 and the two vessels are scheduled for completion in the spring of 1932. The Navy Department, Washington, D. C., has authorized the building of a new submarine, V-8, at the Portsmouth, N. H., navy yard, with displacement of 1,100 tons. Bids are being received by the department until April 16 for the construction of a similar unit, to be known as V-9. A New York manufacturer has secured a contract for propulsion machinery for steamships to be built in New Jersey and San Francisco, totaling $985,000; work on the vessels is in progress. The same maker has obtained another contract for marine control apparatus from a New Jersey boat builder in amount of $52,000.

### CONSTRUCTION PROJECTS

Quartermaster, Second Corps Area, Governors Island, N. Y., will receive bids until March 16 for a marine type reversible Diesel engine with accessories (Circular 5). Signal Supply Officer, Signal Section, Army Base, Brooklyn, N. Y., is asking bids until March 17 for electrical supplies, including insulators, etc. (Circular 100); also, at same time, for receptacles, resistors, etc. (Circular 101). University of Buffalo, Buffalo, N. Y., has filed plans for a power plant to cost $200,000. Seneca Copper Mining Company, New York, plans extensions and improvements in power department at mining properties near Calumet, Mich., including compressor plant, electric-operated pumping plant and other units. Philadelphia Electric Comany, Philadelphia, Pa., has approved plans for power plant to cost about $150,000. Pennsylvania Power Company, New Castle, Pa., plans extensions and improvements in plants and transmission system in New Castle district during 1931, to cost over $600,000. Pittsburgh Terminal Coal Corporation, Pittsburgh, Pa., plans coal-washing plant at Avella, Pa., to cost about $350,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until March 17 for three Diesel engine-generator sets for submarine base (Schedule 5195).

## SOUTHWEST

—THE VOLUME OF BUSINESS *has continued about the same as previously reported. The bulk of contracts closed are still for industrials and practically all of the stock apparatus moved is for manufacturing companies.*

The following orders have been placed since last report: 6,500-kw. turbo unit for a cement company in southern Missouri to cost $105,000, another order of $40,000 covers apparatus for the same company including two synchronous motors of 1,250 hp. each, a small lot of motors of miscellaneous sizes valued at $4,000 and a 450-hp. synchronous motor for a St. Louis manufacturing company valued at $5,000.

### CONSTRUCTION PROJECTS

St. Louis Electric Terminal Railway, St. Louis, Mo., will soon take bids for a freight and warehouse terminal and passenger station estimated to cost $5,000,000. Vinita, Okla., contemplates electric light and power plant to cost $250,000. Luling Oil & Gas Company, Luling, Tex., plans gasoline refining plant and carbon black plant to cost over $125,000. West Texas Utilities Company, Abilene, Tex., plans extensions in transmission lines for service at Clarendon, Dumas, Sonora, Afton and other points.

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## NEW ENGLAND

—INDUSTRIAL EQUIPMENT *is leading in interest in the electrical market in this district. One prominent manufacturer reports that the volume of orders for the period ended last week showed an increase over that for last year.*

Recently an order for a 4,000-kw. turbo-generator and accessories was received from a prominent manufacturer. Small motors and fractional-horsepower motors are receiving more attention by machine tool manufacturers, according to one manufacturer. Inquiries for central-station supplies are increasing and sales are reported of a group of outside switches and control equipment for delivery in the central Atlantic district. Electric lighting for factory purposes is attracting interest. A contract has been awarded for several hundred lighting units for a new industrial manufacturing plant in Massachusetts, in which are included a number of combinations of Cooper-Hewitt mercury-vapor lamps and incandescent lamps. Appropriations for new street-lighting units in many Massachusetts municipalities are noted.

### CONSTRUCTION PROJECTS

Littleton Hospital, Littleton, N. H., will soon take bids for an institutional building and power plant to cost $100,000. Central Massachusetts Electric

Company, Palmer, Mass., contemplates construction of a power substation at Longmeadow, Mass. Cape & Vineyard Electric Company, Falmouth, Mass., will ask bids in April on general contract for addition to steam-electric power plant at Martha's Vineyard, to cost about $100,000, with equipment.



## MIDDLE WEST

—GENERAL BUSINESS *in the Middle West section continues to show improvement. As each week passes more and more evidence is observed that business has settled down and progress is being made.*

—THE HYSTERIA, *so prevalent a while back, is disappearing and normal buying is taking its place. Encouraging reports from the major industries indicate that February has shown an improvement and that confidence in the future is returning.*

The steel and automotive industries are in a somewhat better position with a slight increase in employment noted. The railroads are resuming their equipment and maintenance purchasing and building construction work shows a gain over the previous month. Some stimulation in retail trade is observed and a welcome increase in the production of electrical energy is recorded this week. The various utility companies are proceeding conservatively, planning their construction and extension schedules at about the same rate for the next quarter as in the first quarter.

Among the interesting items placed this week were two station type system storage batteries complete to cost approximately $320,000, and several construction orders aggregating $75,000.

### CONSTRUCTION PROJECTS

Bangor, Wis., contemplates installation of a light and power distributing system. Henry B. Kenny Company, Plymouth Building, Minneapolis, Minn., engineer, is preparing plans for a dairy plant at Wilson, Wis., to cost $350,000. Consumers Power Company, Jackson, Mich., is planning extensions and improvements in the Grand Rapids district, including power plant and transmission lines, to cost over $5,000,000. Commonwealth Edison Company, Chicago, Ill., plans power substation to cost over $1,000,000. Western Electric Company, Chicago, Ill., plans addition to cable works at Hawthorne, for production of loading coils, to cost over $800,000. Richmond and Anderson, Ind., plan extensions and improvements in electric power plants to cost over $600,000 and $80,000, respectively. Bryant Heater & Manufacturing Company, Cleveland, Ohio, has authorized plans for new gas heater manufacturing plant to cost over $250,000. Northwestern Public Service Company, Huron, S. D., plans power plant at North Platte, Neb., to cost over $500,000.

## PACIFIC COAST

—WHOLESALERS REPORT *an increase in the size of the average order, which reflects increasing business in all lines. Contractors report decreasing electrical unemployment and that the first week of February marked the poorest business of many years, since when a steady increase has been perceptible.*

The past week was marked by record-breaking government appropriations for the Pacific coast. These include 85 new post office buildings, widely scattered over California, averaging $100,000 each, and a $3,000,000 post office and a $6,000,000 federal building for Los Angeles, in addition to the $15,000,000 already appropriated. Other major construction projects to begin about July include the Sunnyvale dirigible base and the Western Pacific 35-mile freight extension up the Peninsula into San Francisco. Los Angeles is to vote upon a $12,000,000 school bond issue. $1,000,000 worth of turbine and other heavy power apparatus purchases is still pending in San Francisco, and a significant order covers six 200-hp. General Electric Motors valued at $12,000 sold to an Oakland manufacturer of pumps, their ultimate destination being the Boulder dam site.

Other interesting orders include several carloads of creosote for treating stock poles, copper wire and telephone cable for the national parks, an award for installing 600 poles along a San Francisco boulevard highway, a 70-hp. turbine for El Paso installation by an oil company, 4 miles of No. 000 trolley wire for the San Francisco municipal railway, a $29,000 award for new electrical distribution system for the University of California hospital, a $14,000 wood pole purchase by the city of Glendale, 5,000 ft. of 500,000-circ.mil, 5,000-volt leaded cable for Los Angeles and three carloads of high-tension insulators valued at $40,000 for southern California.

Motor and apparatus sales reported by Seattle jobbers last week included twenty pumping units involving 2- to 6-in. pumps and motors from 50 hp. down to eastern Washington orchards, 33 motors from 200 hp. down to a mine in Idaho, twelve machines from 100 hp. down to an Alaska cannery, 32 machines from 5 hp. down to woodworking machinery manufacturers, 40 motors ranging from 20 hp. down to city of Spokane, which is changing from d.c. to a.c.; 22 motors from 25 hp. down to a Tacoma sawmill, and 30 ranging from 50 hp. down to Alaska dealers. Other sales reported are a 25-kv. breaker to a central station in Oregon, $2,000 worth of miscellaneous switchgear in the Seattle field, about 60 transformers in Seattle field, ranging from 200 kv. down, and of panel units for a large department store in Portland approximating $2,000. The Columbia River Power Company, Stuart building, Seattle, plans to start work this summer on a $15,000,000 hydro-electric power project on Columbia River at Cascade Rapids developing 235,000 hp. and the Puget Sound Power & Light Company will start work March 15 constructing transmission lines on the Wenachee-Skykomish overhead lead, an improvement estimated to cost $200,000.

### CONSTRUCTION PROJECTS

California State Harbor Commission, San Francisco, Calif., plans extensions and improvements in cold storage and refrigerating plant to cost $100,000. Los Angeles Gas & Electric Company, Los Angeles, Calif., plans rebuilding of transmission system to increase capacity from 16,500 to 33,000 volts, and will build power substation of 15,000 kva. capacity. Culver City, Calif., will receive bids until March 16 for an ornamental lighting system. Bureau of Yards and Docks, Navy Department, Washington, D. C., plans extensions and improvements in navy yard at Bremerton, Wash., to cost $875,000, also for a machine shop at same yard to cost over $1,000,000, with equipment.

## SOUTHEAST

—A FEW INDIVIDUAL ORDERS *of reasonably satisfactory size were placed last week, but all purchases are of a routine nature and the general volume is off. Business for January and February showed a decrease from the same period of last year.*

A power company in Georgia ordered power transformers amounting to $15,000, while a company in Louisiana ordered similar equipment to the extent of $7,500. Another company in Georgia ordered $7,600 worth of current transformers and disconnect switches and $8,000 worth of bare and weatherproof copper wire. A company in Georgia ordered $6,900 in pole line hardware, while an Alabama company ordered $4,000 worth of guy strand. Some other central-station orders were for $3,850 worth of creosoted pine poles and line hardware and $3,000 worth of insulators. A power company in Georgia has just completed a thirteen-day campaign on table cookery equipment and sold $2,050 worth of such appliances.

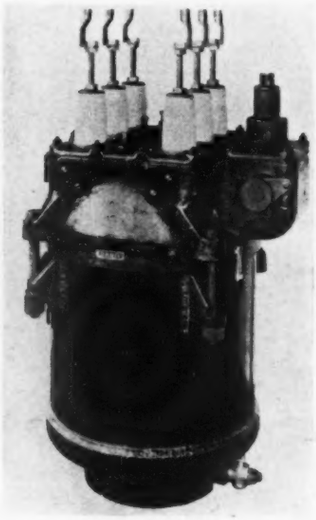
### CONSTRUCTION PROJECTS

Midwest Box Company, Chicago, Ill., will establish corrugated paper box plant at Huntington, W. Va., to cost over $75,000. Kentucky-Tennessee Light & Power Company, Bowling Green, Ky., will proceed with erection of steam-electric power plant with ultimate capacity of 40,000 kw., of which about 10,000 kw. will be installed in 1931, to cost over $700,000, with transmission lines. State Agricultural and Industrial College, Nashville, Tenn., plans agricultural and mechanical buildings.

# New Equipment Available

## Circuit Breaker Has All Poles in One Tank

A NEW OUTDOOR oil circuit breaker, known as type DR-60, offering such features as totally inclosed mechanism, gasketed joint between tank and frame, oil and gas separator and loop contacts, and the fact that all poles are in one



tank, has been announced by the Condit Electrical Manufacturing Corporation, Boston, Mass. A few advantages of these features include smaller space requirements, quick-clearing operation and freedom from oil throwing.

It is furnished three pole, manually or electrically operated for 600 and 1,200 amp., 15,000 volts, with an estimated interrupting capacity of 6,000 amp.

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A NEW BIN SECTION FOR STOCKROOM USE designed so that several can be built on top of each other, like a sectional bookcase, has been announced by the Simplex Tool Company, Woonsocket, R. I. Each section nests deeply into the other and is of sufficient width and depth so that several nested together make a substantial unit. Their portability makes them available for temporary stockrooms sometimes set up at the job on construction work.

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A WIRE ROPE MADE OF CHROME NICKEL ALLOY and said to be immune to salt water or salt air is announced by the Hazard Wire Rope Company, Chicago, Ill. It is flexible and therefore suited to wire rope operations. It is claimed that this rope will operate safely in temperatures up to 1,650 deg. F. The strands and wires are helically shaped to the exact form they assume in the rope structure. Internal stress is eliminated, allowing the individual wires to lie side by side without undue internal friction.

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## Feed Pump Governor Throttles Steam Supply

A NEWLY DESIGNED boiler feed pump governor in which several distinctive features have been incorporated has been announced by the Bailey Meter Company, Cleveland, Ohio. The new governor is designed primarily for use with turbine-driven pumps. Its purpose is to maintain a constant differential between the pressure of steam leaving the boiler and the pressure of feedwater in the feedwater lines.

Feedwater pressure is transmitted to the inside of the sylphon, this force being balanced by the steam pressure and the spring on the outside of the sylphon. When the steam pressure decreases the sylphon expands, moving the valve mechanism upward, thus throttling the supply of steam to the turbine.

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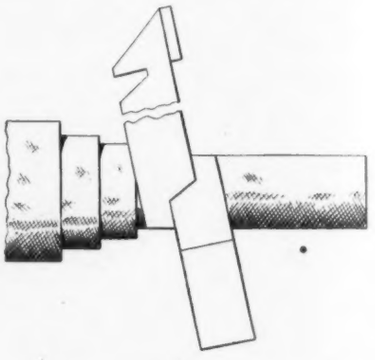
## Brake-Lining Material as Tree Wire Armor

A TREE WIRE whose protection against wear by rubbing of tree limbs consists of an armor of material described as brake-lining wrapped around the rubber compound insulation has been announced by the Okonite Company. The trade name of the new product is "Okolast" and, because of the well-known resistance of brake lining to the most severe abrasion, it has obvious advantages in tree service.

The outer covering of "Okolast" is an impregnated weave of hard-twisted seine twine, this particular form of cotton fabric being chosen because of its superior resistance to wear over the soft-spun-thread braids which commonly are used to absorb and hold impregnating compounds.

## Notch-Lock Feature on Insulation Tape

A NEW AND IMPROVED STYLE in rolls of insulation tapes designed to overcome detrimental features long apparent has been announced by the McIntire Connector Company. The method of securing the outer end of a roll of saturated paper tape with a foreign substance has given trouble in its application. To pre-



vent this and the loss of time and material caused by the difficulty in releasing the end of the tape the new notch-lock feature is added. As the portion of the tape having the notch lock is furnished in excess of the length specified, the full amount required is available for use.

By means of the notch-lock feature it is now possible quickly to lock the tape to the joint and, with the aid of the tab, to obtain the proper initial tension necessary for the highest efficiency. Easily held after one turn and secure against the maximum tension after only a few turns, tape of this character will not require such a high degree of skill in its application, it is claimed.

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A LINE OF BOX FRAME MOTORS in sizes from ½ to 3 hp. has been announced by Robbins & Myers, Inc., Springfield, Ohio. Among some of the features claimed for the motors are compact, powerful construction, semi-inclosed end heads, identical mounting dimensions on repulsion-induction, single-phase, polyphase and direct-current types having similar ratings and speeds. An improved wool yarn bearing lubrication system is standard, but ball bearing motors of identical types are built on special order.